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## **Information Systems Division (ISD) Software Training Plan**

**Version Number: 1.1**

**Release Date: April 15, 2005**



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**Goddard Space Flight Center**  
**Greenbelt, Maryland**

National Aeronautics and  
Space Administration

Check <http://software.gsfc.nasa.gov/training.htm> to verify that this is the correct version prior to use.

INFORMATION SYSTEMS DIVISION (ISD)

SOFTWARE TRAINING PLAN

VERSION 1.1

APRIL 15, 2005

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## **Preface**

The Information Systems Division (ISD) Software Training Plan is under Engineering Process Group (EPG) configuration control. Approved changes to this document should be listed on this page as follows:

<u>Version</u>	<u>Date</u>	<u>Section</u>	<u>Description of Change</u>
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Changes or questions concerning this document should be addressed to the EPG Lead.

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# 1. Introduction

## 1.1 Purpose

The purpose of this plan is to present the goals, approach, and plans for ISD software-related training to Information Systems Division (ISD) personnel, ISD customers, and Goddard Space Flight Center (GSFC) personnel who collaborate with the ISD in software engineering best practices. The most recent version of this plan can be found on the Web at: <http://software.gsfc.nasa.gov/training.htm>.

This plan will be updated annually. Notification of updates will be made via e-mail to all Code 580 personnel.

## 1.2 Scope

### 1.2.1 ISD Organizational Goals

Training is critical to the ISD and is used for a variety of purposes including<sup>1</sup>:

- Maintaining technical competence;
- Instilling systems engineering in software life-cycle processes;
- Developing professional management skills;
- Maintaining intergroup coordination;
- Developing as an organization; and
- Assuring employees receive center-mandated training such as ethics, safety, ISO 9001, computer security, et al.

The ISD uses a variety of training techniques including:

- Mentoring;
- On-the-job training;
- Course-work;
- Full-time study;
- Conference attendance;
- Individual Development Plans;
- Involvement in professional societies;

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<sup>1</sup> Modified from MSFC ED14-TrP-PLAN, 5/03



- Guided self study; and
- Authoring papers.

### 1.2.2 Training Plan Goals

This training plan focuses on a subset of the ISD organizational goals. This plan is organized around three training goals:

- To deploy ISD-proven best practices as defined by ISD process assets in the areas of project management, product development, acquisition, and organizational support (see the ISD process asset library at <http://software.gsfc.nasa.gov/process.cfm> for details on ISD process assets);
- To provide awareness of key software development issues to ISD customers and collaborators;
- To enhance the skills of ISD developers and team leads; and
- To ensure compliance of NPR 7150.2 across the ISD and GSFC.

Each of these three goals has a corresponding approach to training, as described in Section 2.1.

This plan is primarily focused on improving the performance of ISD software projects. The ISD training program is part of a larger effort by the ISD and its constituent branches to identify, document and deploy best practices for software engineering on ISD projects. ISD projects support flight and ground mission software, scientific data processing, administrative support, and advanced technology research and development (R&D).

As the ISD is the center of excellence for software engineering knowledge at GSFC, it is anticipated that the training produced for ISD projects will be applicable across GSFC with minimal modification.

This training plan excludes the general training provided by the GSFC Training Office, for example training in information technology (IT) security, or in the use of Power Point. Training that is relevant to ISD software projects will be identified, but the GSFC Training Office will retain the responsibility for procuring and offering this training. This plan lists all training that is part of the curriculum and identifies whether the training ISD-developed or procured from outside the Division. Training offered by other sources (e.g., HQ, GSFC, commercial) should be recommended if it fits the curriculum.

### 1.3 Applicable Documents

The following documents are applicable:

- GPR 3410G, Employee Competence and Quality Management System (QMS) Training, July 29, 2003
- NPD 2820.1, NASA Software Policies

- NPR 7120.5B, NASA Program and Project Management Processes and Requirements
- NPR 7150.2, NASA Software Engineering Requirements

#### **1.4 References**

The following will be used as a reference for available training and providers:

- GSFC Training and Professional Development (<http://ohr/DevGuide/main.htm>)
- NASA Academy of Program and Project Leadership (APPL)
- NASA Engineering Training (NET)
- Training information from other centers as available through the NASA Software Working Group

#### **1.5 Document Organization**

Section 1 provides introductory material pertaining to the ISD training plan.

Section 2 details the ISD training approach including the steps of the ISD training process, roles and responsibilities of various groups, and the proposed ISD curriculum.

Section 3 presents the near-term ISD training plan and details deliverables and schedules for the current and future fiscal years.

Section 4 presents a long-term training plan that covers deliverables and schedules for several additional years.

Appendix A maps the training items to each of the ISD roles. It specifies whether the training is offered in-house, provided by a vendor, or to be developed. It also indicates whether the training is required, optional, or not required of each individual role.

Appendix B presents various definitions including definitions of ISD skills, skill levels, and software classes (from NPR 7150.2). These definitions are needed to interpret the information in Appendix C.

Appendix C contains matrices of ISD skills vs. roles. It presents a table for each individual ISD role. For each role, it lists the skill areas and identifies what level of expertise is required (cursor, proficient, expert). It further maps the skills to various components of the various maturity levels.

Appendix D presents more detailed information regarding the training including the instructor, duration, and description for each training item. This material will ultimately be extracted from the training database.

Appendix E lists points of contact for ISD training providers.

Appendix F provides sample forms including various registration forms, a Training Waiver Form, Training Evaluation Form, and Training Attendance Forms.

Appendix G contains a listing of acronyms and abbreviations used in this training plan.

## 2. Training Approach

The ISD training approach consists of a number of activities ranging from requirements collection to conducting training. Training may be in the form of courses or modules. Courses are typically four hours or more in duration and may be traditional classes or consist of multiple modules. Modules are shorter in duration (i.e., less than four hours) and may be less formal (e.g., briefings presented at branch meetings). The steps of the ISD training process<sup>2</sup> include:

### Phase 1: Training Planning and Preparation

1. Collect and analyze software training requirements (at least annually).
2. Determine differences between training requirements and current offerings.
3. Establish curriculum and identify new training needed.
4. Identify potential training providers.
5. Develop or procure training.
6. Internally review new software training modules.
7. Store appropriate training materials (instructor and student) in a controlled area.

### Phase 2: Training Implementation

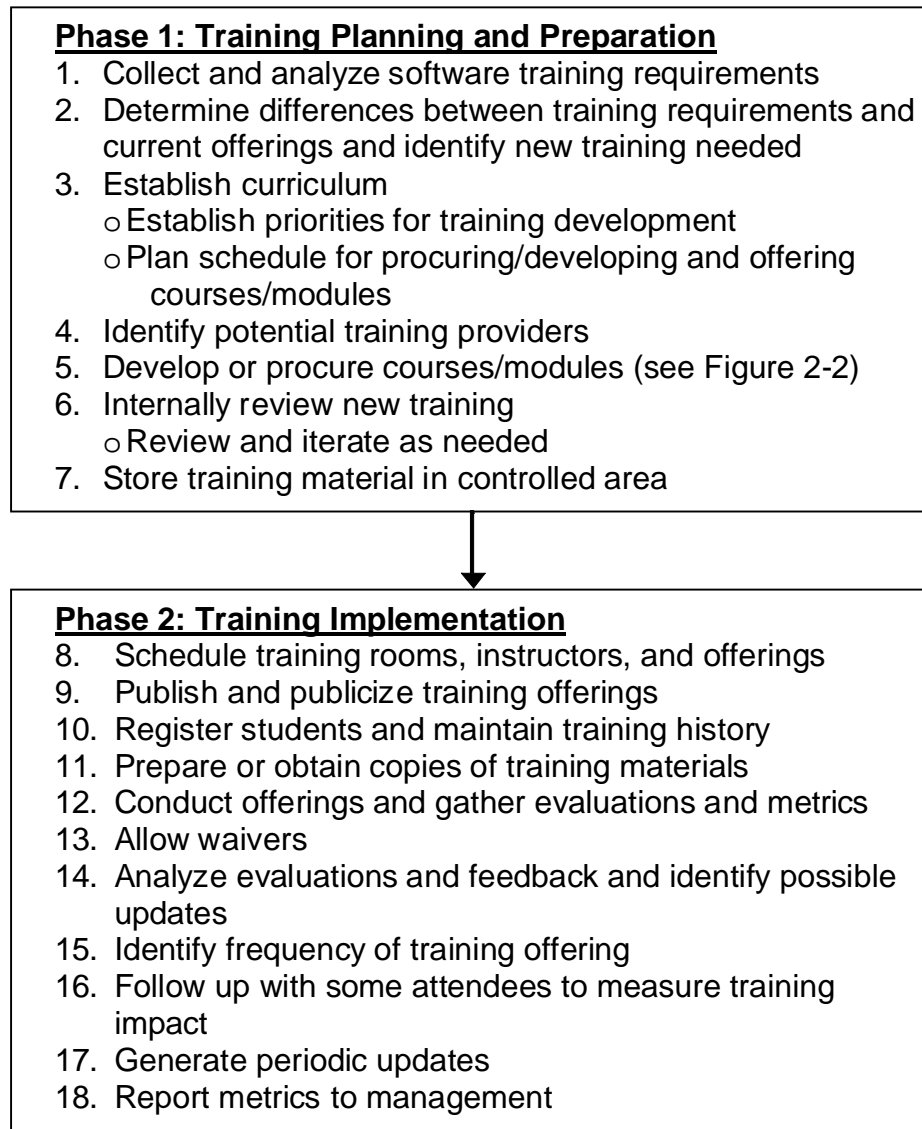
8. Schedule training rooms, instructors, and course/module offerings.
9. Publish and publicize training offerings.
10. Register students and maintain training history.
11. Prepare or obtain copies of training materials, as needed.
12. Conduct training and gather evaluations and metrics.
13. Allow waivers, as appropriate.
14. Analyze evaluations and feedback and identify possible updates.
15. Based on feedback, identify frequency of how often course/module should be taught during a calendar year.
16. Measure training impact by following up with a representative set of training attendees.
17. Generate periodic updates to course/module content to correct errors and to reflect new practices and approaches.
18. Report training metrics periodically to management.

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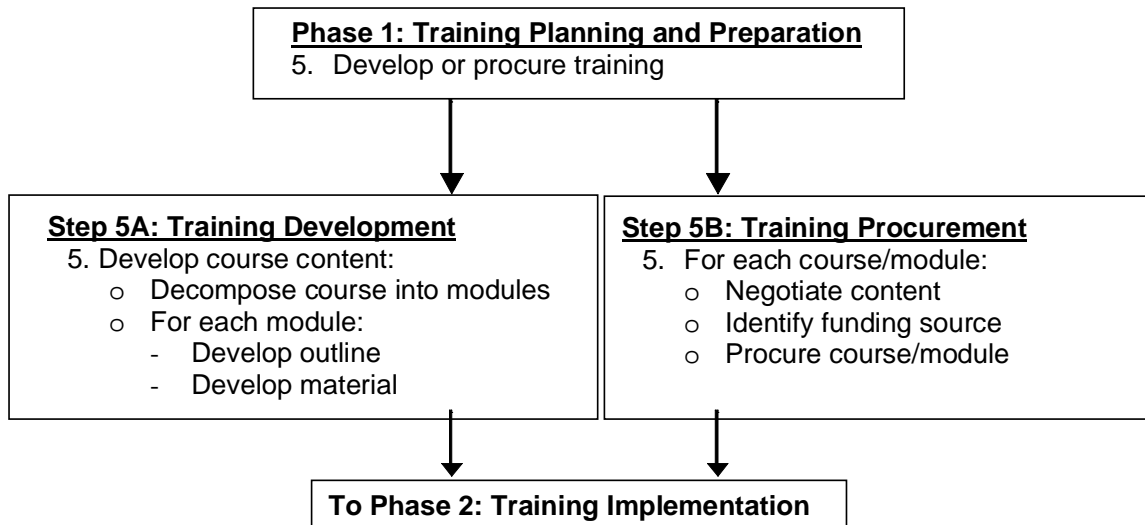
<sup>2</sup> Modified from the JPL Software Training Plan, Version 2.0, 3/19/04

Figure 2-1 shows the two-phased approach of the ISD training process. During the first phase, Training Planning and Preparation, the curriculum is developed, curriculum and management priorities are established, and the training is developed or procured. During the second phase, Training Implementation, training is ultimately offered.

Section 2.2 provides details about the processes shown in Figure 2-1. Section 2.3 describes the roles of various groups including ISD practitioners, the training team, and the training audience. Section 2.4 discusses the ISD training curriculum.



**Figure 2-1. ISD Training Process**



**Figure 2-2. Step 5: Training Development vs. Training Procurement**

## **2.1 Types of Training**

This section describes four types of training: ISD Process Training, Awareness Training, Software Engineering Education, and Mentoring/Deployment. ISD Process Training addresses the goal of deploying ISD process assets. Awareness Training addresses the goal of providing awareness of software issues to ISD staff as well as to ISD customers and collaborators. Software Engineering Education addresses the remaining goal of enhancing workforce skills. Mentoring/Deployment training is intended to help deploy ISD processes with the ultimate goal of assisting projects.

Of these training types, training for ISD process assets and awareness will generally be developed in-house, as they are communicating how the ISD does business. Conversely, Software Engineering Education will generally be done through externally-procured training. There may be exceptions to these generalities; nonetheless they are useful in thinking about how the training program will be carried out. The following sections describe each of these types of training.

### **2.1.1 ISD Process Training**

The purpose of this training is to teach ISD personnel the best practices they should be applying on the job. The material in these courses/modules will be based on practices that have been successfully carried out on previous ISD projects, with the expectation that these practices will be applied to subsequent projects. This training material will be based on the procedures, guidelines, and templates documented by the ISD and its constituent branches.

The approach to process training is role-based. With role-based training, the courses/modules prepare students to carry out specific project roles such as tester or team lead. To do this, the material will combine lecture material with either classroom

exercise or on-the-job training (under the supervision of a senior team member) to rehearse the best practice. Mentoring may also be performed later by the line organization.

An alternate model is to provide checklists of items for on-the-job mentors to cover with the learner; this is useful if there is a case where training is needed but not for enough individuals to form a class. These checklists can also be used by students who have taken training as reminders of what they need to carry forward to their job.

#### 2.1.2 Awareness Training

Awareness Training addresses the goal of providing awareness of software issues to ISD staff as well as to customers and collaborators. This training is of two types. The first type can provide general awareness of software development issues. An example of this is the Capability Maturity Model Integration (CMMI) overview class. This type of training can provide a general awareness of the complexities of software development.

The second type provides specific information to guide the cooperation between ISD software teams and Project Offices or other AETD teams. An example of this is the *Mission Software for Project Managers* course. This course presents an overview of mission software including the interaction between the software development project and the larger Project. It details when products are needed by software developers as inputs to their work and establishes what information is contained in software team products such as Product Plans or status reports.

This second type is similar to the Process training in that it is intended to convey the specifics of how ISD does business. The difference is that the training presents the communication *between* an ISD team, its customers, and teams with which it is collaborating. It does not focus on the details of what each group does to create their deliverable products.

#### 2.1.3 Software Engineering Education

The software engineering education focuses on improving general skills (e.g., the Java language). It is particularly appropriate for teams that are piloting a process or technology for the first time.

This kind of training consists of more traditional approaches including university class, seminars (e.g., Technology Education and Assessment Seminars (TEAS), Code 100 courses or conference tutorials). Most of this is outside the scope of ISD training development; the training team should generally identify opportunities rather than developing courses/modules of this type.

#### 2.1.4 Mentoring/Deployment

The goal of the ISD Mentoring/Deployment efforts is to assist projects by deploying ISD proven processes. This deployment might occur in a variety of ways.

Mentors may be assigned to specific projects to assist those projects in software process improvement (SPI)-related activities such as initiating measurement programs, utilizing earned value methods, modifying product plans to address gaps identified in CMMI pre-assessments, etc. Training (lectures, et al.) is also provided to address a variety of topics. Appendix D provides information on lectures that have been identified.

## **2.2 ISD Training Process**

This section describes each of the phases of the ISD training process as depicted in Figure 2-1: training planning and preparation and training implementation. It also briefly discusses the process by which an organization can request specific training outside the boundaries of the training's normal offering cycle.

### **2.2.1 Phase 1 – Training Planning and Preparation**

The steps in the training planning and preparation phase are detailed below.

1. Collect and analyze software training requirements.

This is done by the training team and reviewed by the Engineering Process Group (EPG).

2. Determine differences between training requirements and current offerings and identify new training needed.

This analysis is done by the training team and reviewed by the EPG.

- a. List training needed based on reading of documented processes and discussions with ISD managers and key technical personnel.
- b. Identify existing training owned by ISD and its branches.
- c. Identify outside training that may fulfill the requirements. Sources for this training include universities, training vendors, GSFC or NASA training offices, conference tutorials, on-line courses, APPL, or seminars such as TEAS.
- d. Provide a make/buy recommendation for each course/module.
- e. For each course/module, determine target audience and if the training is required or not.

3. Establish curriculum.

- a. Establish priorities for training development.

Priority setting involves both managers and the training coordinator, with final approval residing with ISD management.

Priorities can be established in several ways. At the highest level, priorities may be set according to domain (e.g., flight or ground software) or role (e.g., team lead, developer, or tester). Once these broad priorities are established, a complete ordering for training development is produced. These priorities will be based on

the needs of current projects, availability of subject matter experts to develop training, and estimates of the size of each course/module.

b. Plan schedule for procuring/developing and offering training.

The training coordinator does the detailed planning of training development, with inputs from management on the availability of subject matter experts' time. At this point the plan contains completion date and effort estimates for entire courses/modules. The training development team does the detailed planning of interim milestones.

The initial curriculum for ISD training is presented in Section 2.4.

4. Based on input from step 2, identify potential training providers.

5. Develop or procure course/module.

a. Training Development - For training developed in-house, the steps include:

- Form a *training development team* with a *training expert* providing support to the *subject matter expert(s)* developing the training. The *packaging expert* serves as a consultant when needed.
- For each course, decompose the course into modules. Then, for each module:
  - Develop an outline of each module; and
  - Develop the material for each module.

b. Training Procurement

Training may be procured from within NASA and also from external sources. Steps to procure training include:

- Negotiate course/module content;
- Identify funding source; and
- Procure course/module.

6. Internally review new modules/courses

a. Review and iterate as needed. These modules can then be placed under version control as separate items; the course is considered complete when all its constituent modules are completed and under version control.

7. Store training materials (instructor and student) in a controlled area. Ensure that course/module description is stored in ISD training database and that a hardcopy is kept for potential audits.



### 2.2.1.1 Mitigating Cost Risk

Training development is an expensive process; it may cost as much as a staff year to develop, pilot, revise, and deploy a 40-hour course.<sup>3</sup> There are several options that can be used to mitigate this expense.

- *Modular, incremental training development.* Decomposing courses into smaller increments allows each module to be developed, piloted, revised and placed under version control as a separate entity. The implication of this is that useful material can be produced and deployed early, rather than waiting until well over half the resources are expended before any material is piloted.
- *Integration of training and process documentation.* Training and process documentation have similar intentions, that is, to convey best practices to the people that are expected to carry them out. Training material tends to be more detailed than process documentation, particularly “expert mode” checklists that remind experienced personnel to address issues they already understand. Combining work on these two items means that the content will need to be thought through once, rather than twice, so some of the development cost can be shared.
- *Plan for reuse where possible.* Much of the information to be conveyed can be reused across different application areas. Some of this reuse is trivial; for example earned value methods are management techniques that can be applied consistently across applications. Even more technical areas such as testing follow the same general outline of activities, but differ at the more detailed level of description. In addition to sharing between applications, there is much information that is common across different roles such as developer and tester. Specialized training needs to be developed based on application and role, but the shared elements need to be identified so that work is not duplicated.
- *Relax formality if circumstances dictate.* There is nothing in this plan that should preclude branches or development teams from doing informal training independently from this program, if an unanticipated need arises. This sort of training can be done more rapidly, and if the material is then deemed useful to a larger audience it can be edited to fit ISD style and piloted as an ISD course/module.

### 2.2.2 Phase 2 – Training Implementation

The steps in the training implementation phase of the ISD training process include:

8. Schedule training rooms, instructors, and offerings.
  - a. Escort instructor(s), if needed.
  - b. Help with AV set up.
  - c. Maintain a list of possible training rooms, their capacity, and technical attributes.

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<sup>3</sup> The FDD training director estimated 50 hours per classroom hour in the late 1980s, early 1990s time frame.

9. Publish and publicize training offerings.
10. Register students and maintain training history.
  - a. Report attendees to GSFC Training Office to get training recorded in training database.
  - b. Add attendees to ISD training database.
11. Prepare or obtain copies of training materials, as needed.
12. Conduct offerings and gather evaluations and metrics.
  - a. Teach pilot offering.
  - b. Place under version control.
13. Allow waivers, as appropriate. An employee may have required training waived by line management [TBR] based on the following experience(s): (a) qualified work; (b) documented on-the-job training; and/or (c) education. The waived training is recorded on Form [TBD] and the records are maintained in the ISD training database.
14. Analyze training evaluations and feedback and identify possible updates.
15. Measure training impact by following up with a representative set of training attendees.
16. Generate periodic updates to training content.
17. Report training metrics periodically to management.

### **2.2.3 How an Organization Requests Training**

This section will eventually describe the process through which an organization can request one or more courses/modules. Until the process is provided, contact the ISD training coordinator for further information on how to acquire training (see Appendix E for points of contact).

## **2.3 ISD Training Roles**

Carrying out a first class training program involves several groups: ISD managers; ISD practitioners who are subject matter experts who help write training material; the training team that is implementing the program; and the audience for whom the training is intended. The following sections describe the roles of these groups.

### **2.3.1 Role of ISD Managers**

The *ISD managers* include both Branch and Division management, who:

- Manage existing personnel management responsibilities with respect to training, including determining which training should be included in performance planning.
- Participate in defining the curriculum and setting priorities for training development;

- Plan time for subject matter experts to develop and teach courses/modules; and
- Assign mentors to personnel who are novices in a project role.

### 2.3.2 Role of ISD Practitioners

ISD practitioners are technical *subject matter experts*. These *subject matter experts*:

- Produce lecture material and exercises for courses/modules;
- Review material for training other subject matter experts are developing;
- Teach course/module offerings; and
- Mentor novices in their subject area.

There is no implication that the training developer should teach every offering of a course/module, although it is typical for the developer to teach the pilot offering.

### 2.3.3 Role of the ISD Training Team

The ISD training team includes the *training coordinator*, *training expert*, *packaging expert*, and *logistics manager*. The roles of each are described below:

The *training coordinator* is responsible for the overall direction of the ISD training program. This includes:

- Developing and maintaining this Training Plan;
- Working with ISD managers to define a curriculum and to set priorities for training development;
- Assuring that the version control applied to ISD training material is consistent with that applied to other ISD process assets;
- Assuring that ISD training practices are in accordance with GSFC and NASA policies, and to assure that these practices meet the intent of the SPI/CMMI Organization Training process area;
- Coordinating with the GSFC Training Office, NASA Headquarters' Office of Chief Engineer (OCE), and the NASA Software Working Group training initiatives as needed to meet ISD goals;
- Identifying funding sources for each course/module; and
- Reporting training metrics periodically to management.

The *training expert* works with the subject matter expert to create, pilot and maintain courses/modules. This effort includes helping the subject matter expert with:

- Decomposing the course into modules;
- Outlining and developing each module;
- Teaching pilot course/module and subsequent offerings;

- Analyzing training evaluations received;
- Measuring impact of training by following up with some training attendees; and
- Generating updates to the course/module.

The *training expert* also observes and critiques the initial offering, and analyzes the evaluation data from each offering.

The *packaging expert* is responsible for:

- Defining a consistent style for ISD training material;
- Helping training developers follow this style;
- Helping training developers in applying advanced tool features (e.g., Power Point animation) where needed; and
- Carrying out version control activities for training material.

The *logistics manager* carries out all the administrative activities associated with training offerings. These activities include:

- Scheduling rooms and instructors for training;
- Publicizing offerings;
- Registering students for offerings;
- Escorting instructors, if needed;
- Helping with AV setup, if needed;
- Collecting evaluation data, including data entry into any analysis tools being used;
- Preparing or obtaining copies of training material;
- Maintaining training history and assuring that training records are updated; and
- For each course/module offered, the logistics manager is responsible for archiving appropriate material (e.g., attendance lists, evaluation forms).

It is anticipated that individuals will play multiple roles on this project. In particular, the *training coordinator* will also be a *training expert*, and the *packaging expert* and *logistics manager* may be the same person.

#### 2.3.4 Role of the Intended Training Audience

To better define specific roles, the training audience is separated into groups that are descriptive of work that, at the highest level, are common across ISD projects. These groups include *project technical staff* and *project support staff*. Much of the support work (e.g., system administration, quality assurance) is provided to a project team from other groups. On large projects, personnel generally carry out one role, on smaller projects one individual can carry out multiple roles. Tables 2-1 and 2-2 detail the *project technical staff* and *project support staff* roles, respectively.

**Table 2-1. Project Technical Staff Roles**

<b>Project Role</b>	<b>Area</b>	<b>Description</b>
Acquisition Manager (AQM)	Management	Responsible for obtaining products or services via contract.
Development Engineer (DE)	Development	Responsible for detailed design, implementation, integration, and build-integration testing.
Development Team Lead (DTL)	Development	Leads team responsible for developing a given subsystem or system. Performs requirements analysis and high-level design. Also known as Subsystem Lead or Senior Developer.
Maintenance Engineer (ME)	Maintenance	Responsible for implementing corrections and enhancements to systems being maintained.
FSW Lab Manager (LM <sup>4</sup> )	Development	Coordinates and oversees use of flight software development and test laboratories. This includes oversight of equipment and software installation, equipment and software maintenance, floor plans, ESD certification, system administration, security, and property management.
Line Manager (MGR)	Management	Responsible for developing staff, assignment of staff to projects, and monitoring of projects.
Maintenance Team Lead (MTL)	Maintenance	Responsible for leading the team that is maintaining a given system or set of systems.
Product Development Lead (PDL)	Management	Person in charge of project management activities and of leading the team. This role is specified in Appendix A of the ISD Product Development handbook; it is primarily a project management role. The PDL may also act as the DTL.
Software Manager (SM)	Management	Responsible for technical and management oversight of mission software development. This oversight is from both a Project and ISD/AETD point of view, and to both in-house and contracted development. This is a

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<sup>4</sup> LM is a FSW-specific role

<b>Project Role</b>	<b>Area</b>	<b>Description</b>
		project-level role. <i>For flight software projects, this role is called “System Manager.”</i> Depending on skills and job scope, this role may be filled by the DTL.
Software Technology Researcher (STR)	Software Technology	Responsible for developing or identifying potentially useful technologies, running studies to determine how best to use them, and helping transfer proven technologies to GSFC software development projects.
System Engineer/ Architect (SE)	Systems Engineering	Lead engineer responsible for defining a system concept, a high-level design, and key interfaces. Also is responsible for performing trade studies and other engineering analyses, and for liaison with other AETD teams supporting a mission.
Test Engineer (TE)	Testing	Responsible for executing the build verification tests, system tests, and acceptance tests, including evaluation of the results. Supports spacecraft integration and test activities. Also known as Software Tester.
Test Team Lead (TTL)	Testing	Responsible for the integration and test of the entire flight or ground system. Leads an independent test team.

**Table 2-2. Project Support Staff Roles**

<b>Project Role</b>	<b>Area</b>	<b>Description</b>
Configuration Management Officer (CMO)	Development	Responsible for maintaining the integrity of work products through configuration identification, configuration control, configuration status accounting, and configuration audits.
Process Engineer (PE)	Software Technology	Responsible for developing and maintaining ISD process assets, the ISD project data repository, and ISD-specific training classes. Process Engineers are associated with the Engineering Process Group and the GSFC Software Process Improvement Project.

Project Role	Area	Description
Software Quality Engineer (SQE)	Software Assurance	Provides objective assessments of the development team's processes and work products. This role is usually performed by Code 300 personnel working under the direction of the Project office.
Simulator/Tools Engineer (STE)	Development	Develops and installs simulators for software testing. Also installs any software development tools not otherwise supported via branches at an organizational level.

## 2.4 Curriculum

This section identifies the initial set of training items for each of the training goals. A full training database will be maintained as part of the ISD process database that is currently under development. The information shown in this section will ultimately be generated directly from the database.

Table 2-3 presents an initial listing of ISD training items indicating the training type, the training identification number, the intended audience, and whether the training is intended to be a course or module. Courses are typically four hours or more in duration and may be traditional classes or consist of multiple modules. Modules are shorter in duration (i.e., less than four hours) and may be less formal (e.g., briefings presented at branch meetings). Training types are as specified in Section 2: Process, Awareness, and Software Engineering Education. Appendix D provides details on individual training items including duration, provider/instructor, and description.

Process training is organized around the roles that ISD personnel are expected to perform on project, i.e., roles associated with *project technical staff* and *project support staff*. Software Engineering Education training is funded by HQ OCE to support the NASA Software Improvement Initiative or as part of GSFC's education program funded by the Office of Human Resources (OHR) and/or the ISD. Priorities for HQ OCE training must include requests for CMMI appraisals and support.

The training identifier (ID) is a designation used internally by the ISD to distinguish individual training items. The first few characters of the ID indicate the source of the training as follows: APPL/NET - Academy of Program and Project Leadership/NASA Engineering Training, CSM - Center for Systems Management, FSW-Flight Software Branch, GSFC - Goddard Space Flight Center, HQ - NASA Headquarters, ISD-Information Systems Division, JPL - Jet Propulsion Laboratory, QIC - Quality Improvement Consultants, Inc., SEI - Software Engineering Institute, SQE – Software Quality Engineering, and SWG - NASA's Software Working Group.

**Table 2-3. ISD Training Courses/Modules**

<b>Training Title</b>	<b>Training Type</b>	<b>ID</b>	<b>Audience</b>	<b>Course (C)/ Module (M)</b>
Defining Software Processes	Software Engineering Education	SEI001	PE	C
Defining World Class Processes	Software Engineering Education	QIC001	PE	C
Earned Value (Progress Tracking with Earned Value or Point Counting)	Process	ISD001	DTL, PDL, SM	C
Foundations of Project Management	Process	APPL001	[TBD]	C
FSW Developer Training	Process	FSW001	DE	M
FSW Development Lead Training	Process	FSW002	PDL	M
FSW Manager Training	Process	FSW003	DTL, PDL, SM	M
FSW Process Awareness	Process	FSW010	All FSW Personnel	M
FSW SPI Deployment Plan Presentation	Process	FSW004	[TBD]	M
FSW Sustaining Engineering Preparation Training	Process	FSW005	[TBD]	M
FSW System Engineering	Process	FSW006	SE	M
FSW Test Lead Training	Process	FSW007	TTL	M
FSW Tester Training	Process	FSW008	TE	M
Intermediate CMMI	Software Engineering Education	SEI002	PE, Lead Appraisers, Instructors	C



<b>Training Title</b>	<b>Training Type</b>	<b>ID</b>	<b>Audience</b>	<b>Course (C)/ Module (M)</b>
Introduction to Flight Software	Process	FSW009	New FSW personnel	M
Introduction to Software Acquisition (SA)-CMM	Software Engineering Education	SEI003	PE	C
Introduction to the CMMI	Software Engineering Education	SEI004	PE	C
ISD Configuration Management	Process	ISD017	CMO	M
ISD Metrics	Process	ISD018	[TBD]	M
ISD Process Overview	Process	ISD015	All	M
Managing Technological Change	Software Engineering Education	SEI005	All	C
Mastering Process Improvement	Software Engineering Education	SEI006	PE	C
Mastering the Requirements Process	Software Engineering Education	SQE001	DE, TE	C
Mentor Training	Process	ISD016	PE	[TBD]
Mission Software for Project Managers	Awareness	ISD003	DTL, LM, MGR, MTL, PDL, SM	M
Mission Software Risk Management	Process	ISD004	DTL, PDL, SM	[TBD]
Overview of the CMMI <sup>5</sup>	Awareness	CSM002	All	M
ISD Quality Assurance Guidelines	Process	ISD005	SQE	M

<b>Training Title</b>	<b>Training Type</b>	<b>ID</b>	<b>Audience</b>	<b>Course (C)/ Module (M)</b>
Project Monitoring and Control	Process	ISD006	[TBD]	[TBD]
Project Planning	Process	ISD007	[TBD]	[TBD]
Quantitative Software Management <sup>5</sup>	Process	JPL001	DTL, PDL, SM	C
Requirements Engineering Workshop <sup>5</sup>	Software Engineering Education	HQ001	DE, TE	C
Requirements Management Workshop	Software Engineering Education	ISD008	DE, TE	C
Risk Management	Process	GSFC001	[TBD]	C
SEPG/EPG Workshop <sup>5</sup>	Software Engineering Education	CSM003	PE	C
Software Configuration Management <sup>5</sup>	Software Engineering Education	HQ002	CMO, DTL, PDL, SM	C
Software Engineering Technology Infusion ViTS	Awareness	SWG001	[TBD]	M
Software Inspections <sup>5</sup>	Process	HQ003	[TBD]	C
Software Life Cycle, IEEE/EIA 12207 <sup>5</sup>	Process	HQ004	[TBD]	C
Software Metrics ViTS	Awareness	SWG002	[TBD]	M

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<sup>5</sup> HQ OCE-sponsored

<b>Training Title</b>	<b>Training Type</b>	<b>ID</b>	<b>Audience</b>	<b>Course (C)/ Module (M)</b>
Software Project Management <sup>5</sup>	Process	HQ005	DTL, LM, MGR, MTL, PDL, SM	C
Software Project Planning and Control	Process	JPL002	DE, DTL, LM, ME, MGR, MTL, PDL, SE, SM	C
Software Quality Assurance	Software Engineering Education	GSFC004	SQE	C
Software Reliability	Software Engineering Education	JPL003	DE, DTL, LM, ME, MTL, PDL, SE, SM, SQE, TE, TTL	C
Software Requirements Development	Process	ISD009	DTL, PDL, SM	[TBD]
Software Requirements Management	Process	ISD010	DTL, PDL, SM	[TBD]
Software Safety <sup>5</sup>	Software Engineering Education	HQ006	[TBD]	C
Software Testing Management Workshop	Software Engineering Education	ISD011	TE, TTL	C
Software Testing Practices Workshop	Software Engineering Education	ISD012	TE	C
Standard CMMI Appraisal Method for Process Improvement (SCAMPI) Lead	Software Engineering	SEI007	Appraisal team	C

<b>Training Title</b>	<b>Training Type</b>	<b>ID</b>	<b>Audience</b>	<b>Course (C)/ Module (M)</b>
Appraiser Training	Education		members	
Systematic Decision Making	Software Engineering Education	ISD013	[TBD]	[TBD]
Systematic Software Testing	Software Engineering Education	ISD014	TE	C
Systems Requirements	Process	APPL002	[TBD]	C
Technical Manager's Training	Process	GSFC002	[TBD]	C
Using CMMI for Improvement at GSFC	Awareness	GSFC003	All	M

As with Flight Software, once additional domains have been identified, the following training should be considered for those individual domains:

- Introduction to [Domain] Software
- Developer Training
- Management Training
- Software Manager Training
- Sustaining Engineering Preparation Training
- System Engineering Training
- Test Lead Training
- Tester Training

## **2.5 Deliverables**

General deliverables associated with the ISD training process include:

- Reports/updates, as appropriate, to indicate changes to curriculum, schedule of offerings, development schedule, etc.;
- Training material; and
- Training attendance lists, evaluation forms associated with each offering.

### 3. Near-Term Training Plan

#### 3.1 FY04-06 Training Development Plan

This section presents the near-term plan for training for the current and next fiscal year.

In addition to the current and next fiscal year, FY04 historical information is maintained. Near-term training will initially focus on flight software best practices and on training already funded by NASA Headquarters as part of the NASA Software Improvement Initiative. The main drivers for this are to mitigate the expense of developing good training, and to build on work already in progress in the Flight Software Branch.

Table 3-1 lists the baseline set of training that was held during FY04 and is to be held during FY05-06.

**Table 3-1. FY04-06 Training**

<b>Title</b>	<b>ID</b>	<b>FY04 Actuals</b>	<b>FY05-FY06 Target</b>
Intermediate CMMI	SEI002	N/A	One per year
Introduction to the CMMI	SEI004	N/A	One per year - 3/8-3/10/05
Introduction to SA-CMM	SEI003	8/5-8/7/03	
ISD Quality Assurance Guidelines	ISD005	N/A	[TBD]
Mission Software for Project Managers	ISD003	N/A	Five per year
Overview of the CMMI	CSM002	N/A	Two per year 4/11/05
Project Monitoring and Control	ISD006	N/A	Two per year
Project Planning	ISD007	N/A	Two per year
Quantitative Software Management	JPL001	6/15 – 6/16/04*	One per year
Requirement Engineering Workshop	HQ001	N/A	[TBD]
Risk Management	GSFC001	N/A	[TBD]
Software Configuration Management	HQ002	N/A	Three per year
Software Engineering Technology ViTS	SWG001	N/A	3/23/05
Software Inspections	HQ003	11/13/03	Three per year
Software Life Cycle, IEEE/EIA 12207	HQ004	7/13- 7/15/04*	One per year

<b>Title</b>	<b>ID</b>	<b>FY04 Actuals</b>	<b>FY05-FY06 Target</b>
Software Project Management	HQ005	9/27-10/1/04	Spring 2005 (4/10-4/15/05), 2006,
Software Reliability	JPL003	N/A	[TBD]
Software Requirements Development	ISD009	N/A	Three per year
Software Requirements Management	ISD010	N/A	Three per year
Software Safety ViTS	HQ006	2/3-4/13/04 – eleven five-hour weekly sessions	Three per year
Using CMMI for Improvement at GSFC	GSFC003	6/01/04 (Systems Eng. Lecture)	[TBD]

In addition to the above-mentioned training, additional areas of support are funded through the training program. Table 3-2 lists these items.

**Table 3-2. Additional Support FY05-FY06**

<b>Item</b>	<b>Quantity</b>	<b>Duration</b>
SCAMPI pre-appraisal and appraisal preparation	[TBD]	5 days
SCAMPI pre-appraisal	1	[TBD]
SCAMPI appraisal	1	[TBD]
IV&V pre-appraisal preparation	[TBD]	2 days
IV&V SCAMPI appraisal	1	[TBD]

## 3.2 **FY04-06 Priorities**

### 3.2.1 Priorities for Externally-Provided Training

[TBD]

### 3.2.2 Priorities for Internally-Provided Training

During FY05, the goal is get the ISD Flight Software organization to CMMI Level 2. To that end, the following training has been targeted as priority for FY05, depending on available resources:

- ISD Metrics<sup>6</sup>
- ISD Quality Assurance Guidelines<sup>6</sup>
- Project Monitoring and Control<sup>6</sup>
- Project Planning<sup>6</sup>
- Software Configuration Management<sup>6</sup>
- Software Quality Assurance<sup>6</sup>
- Software Requirements Management<sup>6</sup>
- FSW Developer Training
- FSW Development Lead Training
- FSW Manager Training
- FSW Process Awareness<sup>6</sup>
- FSW SPI Deployment Plan Presentation
- FSW Sustaining Engineering Preparation Training
- FSW Systems Engineering Training
- FSW Test Lead Training
- FSW Tester Training
- Introduction to FSW Software
- Risk Management

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<sup>6</sup> Highest priority



### **3.3 FY04-06 Deliverables**

For FY04-06, the following items are slated for delivery:

- Reports/updates, as appropriate, to indicate changes to curriculum, schedule of offerings, development schedule, etc.;
- Training material; and
- Training attendance lists and evaluation forms associated with each offering.

### **3.4 FY04-06 Schedule**

[TBD]

## 4. Long-Term Training Plan

### 4.1 FY07-10 Training Development Plan

FY07-FY10 training will continue and build upon training identified in previous years. Table 4-1 lists the baseline set of courses/modules with the targets for FY07-FY10.

[Note – need to add internally-developed classes such as verification and validation, peer reviews, requirements development, etc.]

**Table 4-1. FY07-10 Training**

Title	ID	FY07 Target	FY08-10 Target
Intermediate CMMI	SEI002	One per year	One per year
Introduction to the CMMI	SEI004	One per year	3 times every 2 years
ISD Quality Assurance Guidelines	ISD005	[TBD]	[TBD]
Mission Software for Project Managers	ISD003	[TBD]	[TBD]
Overview of the CMMI	CSM002	Two per year	Two per year
Project Monitoring and Control	ISD006	[TBD]	[TBD]
Project Planning	ISD007	[TBD]	[TBD]
Quantitative Software Management	JPL001	One per year	One per year
Requirement Engineering Workshop	HQ001	[TBD]	[TBD]
Risk Management	GSFC001	[TBD]	[TBD]
Software Configuration Management	HQ002	Three per year	3 classes every two years
Software Inspections	HQ003	Three per year	Three per year
Software Life Cycle, IEEE/EIA 12207	HQ004	One per year	One per year
Software Project Management	HQ005	Three per year	Three per year
Software Requirements Development	ISD009	Three per year	Three per year
Software Requirements	ISD010	Three per	Three per year

Title	ID	FY07 Target	FY08-10 Target
Management		year	
Software Safety	HQ006	Three per year	Three per year
Using CMMI for Improvement at GSFC	GSFC003	[TBD]	[TBD]

In addition to the above-mentioned training, additional areas of support are to be covered via ISD training. Table 4-2 lists these items.

**Table 4-2. Additional Support FY07-FY10**

Item	FY07	FY08-10
SCAMPI pre-appraisal and appraisal preparation	5 days	[TBD]
SCAMPI pre-appraisal	2 days every 2 years	2 days every 2 years
SCAMPI appraisal	1 every 2 years	1 every 2 years
IV&V pre-appraisal preparation	[TBD]	[TBD]
IV&V SCAMPI appraisal	[TBD]	[TBD]

## **4.2 FY07-10 Priorities**

### **4.2.1 Priorities for Externally-Provided Training**

[TBD]

### **4.2.2 Priorities for Internally-Provided Training**

[TBD]

## **4.3 FY07-10 Deliverables**

For FY07-10, the following items are slated for delivery [TBR]:

- Reports/updates, as appropriate, to indicate changes to curriculum, schedule of offerings, development schedule, etc.
- Training material; and

- Training attendance lists and evaluation forms associated with each offering.

#### **4.4 FY07-10 Schedule**

[TBD]

## Appendix A. Training Mapping to Roles

This appendix maps the training items to each of the ISD roles. It specifies whether the training is offered in-house, provided by a vendor, or to be developed. It also indicates whether the training is recommended, optional, or not required of each individual role.

I – currently offered In-house, V – currently offered by Vendor, D – to be Developed R – Recommended, R* - can be taken in place of another recommended class, R <sup>1</sup> – Only FSW roles take this O – Optional, NR – Not Required for this role or attribute																	
See Tables 2-1 and 2-2 for Role Definitions Shaded titles indicate higher priority items	CMO	DE	DTL	LM	STE	ME	MTL	AQM	MGR	PDL	SM	SQE	PE	STR	SE	TE	TTL
Defining Software Processes	NR	NR	NR	O	O	NR	NR	NR	O	O	O	R	R	O	NR	NR	NR
Defining World Class Processes	O	O	O	O	NR	NR	NR	NR	O	O	O	O	R	NR	R	NR	NR
Earned Value	O	NR	R*	R	NR	NR	O	O	R	R	R	O	NR	R	O	NR	R
Foundations of Project Management	O	R*	O	R*	O	NR	R*	R*	R*	R*	R*	R*	NR	R*	O	NR	R*
FSW Developer Training	O	R <sup>1</sup>	R <sup>1</sup>	O	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	NR	O	O	NR	O
FSW Development Lead Training	O	R <sup>1</sup>	R <sup>1</sup>	O	O	NR	NR	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	NR	O	O	NR	NR
FSW Manager Training	O	O	O	R <sup>1</sup>	NR	NR	R <sup>1</sup>	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	NR	NR	NR	O	NR	O
FSW Process Awareness	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	R <sup>1</sup>	R <sup>1</sup>	O	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>
FSW SPI Deployment Plan Presentation	O	O	O	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	O	NR	NR	NR	NR
FSW Sustaining Engineering Preparation Training	O	O	O	R <sup>1</sup>	O	R <sup>1</sup>	R <sup>1</sup>	O	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	NR	NR	O	O	NR	O
FSW System Engineering	O	R <sup>1</sup>	R <sup>1</sup>	O	O	NR	O	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	NR	O	R <sup>1</sup>	NR	O
FSW Test Lead Training	NR	R <sup>1</sup>	R <sup>1</sup>	O	R <sup>1</sup>	O	R <sup>1</sup>	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	NR	NR	O	R <sup>1</sup>	R <sup>1</sup>
FSW Tester Training	NR	R <sup>1</sup>	R <sup>1</sup>	O	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	NR	NR	O	R <sup>1</sup>	R <sup>1</sup>
Intermediate CMMI	O	O	O	O	O	O	O	O	O	O	O	O	R	O	O	O	O
Introduction to Flight Software	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	O	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>	O	O	NR	R <sup>1</sup>	R <sup>1</sup>	R <sup>1</sup>

<b>I</b> – currently offered In-house, <b>V</b> – currently offered by Vendor, <b>D</b> – to be Developed <b>R</b> – Recommended, <b>R*</b> - can be taken in place of another recommended class, <b>R<sup>1</sup></b> – Only FSW roles take this <b>O</b> – Optional, <b>NR</b> – Not Required for this role or attribute																	
See Tables 2-1 and 2-2 for Role Definitions Shaded titles indicate higher priority items	<b>CMO</b>	<b>DE</b>	<b>DTL</b>	<b>LM</b>	<b>STE</b>	<b>ME</b>	<b>MTL</b>	<b>AQM</b>	<b>MGR</b>	<b>PDL</b>	<b>SM</b>	<b>SQE</b>	<b>PE</b>	<b>STR</b>	<b>SE</b>	<b>TE</b>	<b>TTL</b>
Introduction to SA-CMM	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Introduction to the CMMI	O	O	O	O	O	O	O	O	O	O	O	O	R	O	O	O	O
<b>ISD Configuration Management</b>	R	NR	NR	R	NR	NR	R	NR	R	NR	NR	NR	NR	NR	NR	NR	NR
<b>ISD Metrics</b>																	
ISD Process Overview																	
<b>ISD Quality Assurance Guidelines</b>	R	R	R	O	O	NR	O	NR	O	O	O	R	O	O	O	O	O
Managing Technological Change	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	R	R	NR	NR	NR
Mastering Process Improvement	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	O	R	NR	NR	NR	NR
<b>Mentor Training</b>	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Overview of the CMMI	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
<b>Project Monitoring and Control</b>	R	R	O	R*	NR	NR	R	R	NR	R	R	O	NR	O	O	O	R*
<b>Project Planning</b>	R	R	O	R*	NR	NR	R	R	NR	R	R	O	NR	O	O	O	O
<b>Quantitative Software Management</b>	O	R*	O	R*	O	NR	R*	R*	R*	R*	R*	R*	NR	R*	O	NR	R*
Requirements Engineering Workshop	O	O	O	O	O	NR	O	R*	R	R	R	R	O	O	R*	R*	R*
<b>Requirements Management Workshop</b>	O	O	R*	O	O	NR	O	R*	R	R*	R	R	O	O	R*	R*	R*
<b>Risk Management</b>	O	O	O	O	O	NR	O	R*	R	R	R	NR	NR	R	O	NR	O
SEPG/EPG Workshop	NR	NR	NR	NR	NR	NR	NR	NR	R*	R*	R*	R*	R*	NR	NR	NR	NR
<b>Software Configuration Management</b>	R	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Software Engineering Technology Infusion ViTS	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Software Inspections	O	R	R	NR	NR	NR	O	NR	O	R*	R	NR	O	NR	R*	O	O

<b>I</b> – currently offered In-house, <b>V</b> – currently offered by Vendor, <b>D</b> – to be Developed <b>R</b> – Recommended, <b>R*</b> - can be taken in place of another recommended class, <b>R<sup>1</sup></b> – Only FSW roles take this <b>O</b> – Optional, <b>NR</b> – Not Required for this role or attribute																	
See Tables 2-1 and 2-2 for Role Definitions Shaded titles indicate higher priority items	<b>CMO</b>	<b>DE</b>	<b>DTL</b>	<b>LM</b>	<b>STE</b>	<b>ME</b>	<b>MTL</b>	<b>AQM</b>	<b>MGR</b>	<b>PDL</b>	<b>SM</b>	<b>SQE</b>	<b>PE</b>	<b>STR</b>	<b>SE</b>	<b>TE</b>	<b>TTL</b>
Software Life Cycle, IEEE/EIA 12207	O	R*	R*	NR	O	O	O	NR	R*	R*	R*	R*	NR	O	O	O	O
Software Metrics ViTS	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
<b>Software Project Management</b>	O	R*	O	R*	O	NR	R*	R*	R*	R*	R*	R*	NR	R*	O	NR	R*
<b>Software Project Planning and Control</b>	O	R	R	R*	O	O	R*	O	R*	R*	R*	O	NR	O	O	O	O
<b>Software Quality Assurance</b>	R	O	O	NR	O	O	O	O	O	O	R	R	O	O	O	O	O
Software Reliability	O	O	O	O	O	NR	NR	O	O	O	O	R	NR	O	O	O	O
Software Requirements Development	O	O	R*	O	O	NR	O	R*	R	R*	R	R	O	O	R*	R*	R*
<b>Software Requirements Management</b>	O	O	R*	O	O	NR	O	R*	R	R*	R	R	O	O	R*	R*	R*
Software Safety	O	O	O	O	O	NR	NR	O	O	O	O	R	NR	O	O	O	O
Software Testing Management Workshop	NR	R	O	NR	O	NR	O	O	O	O	O	O	NR	O	O	R	R
Software Testing Practices Workshop	NR	R	O	NR	O	NR	O	O	O	O	O	O	NR	O	O	R	R
Systematic Decision Making	O	O	O	O	NR	NR	O	O	R*	R*	R*	O	O	R	R	NR	NR
Systems Requirements	O	O	R*	O	O	NR	O	R*	R	R*	R	R	O	O	R*	R*	R*
<b>Technical Manager's Training</b>	O	R*	O	R*	O	NR	R*	R*	R*	R*	R*	R*	NR	R*	O	NR	R*
<b>Using CMMI for Improvement at GSFC</b>	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

## Appendix B. Definitions

### B.1 Skills

Skill	Definition
<b>Project Management</b>	
Task Planning (WBS, SMP/PP)	Creating a software management plan (SMP)/product plan (PP) based on high-level project requirements and standard ISD processes.
Life Cycle Models/Process Tailoring	Selecting the project life cycle and adapting organization processes to the needs of a specific project.
Acquisition Planning	Planning the acquisition of either software products to incorporate into a system or of software development services.
Size and Complexity Estimation	Estimating the scope of a project based on features desired by the customer.
Software Cost and Schedule Estimation	Estimating the cost and duration of a project based on the estimated size and complexity.
Progress/Earned Value: Planning	Creating detailed work assignments, assigning an appropriate number of progress points to them, and initializing a tracking system.
Measurement for Project Management	Using metrics to track project against project management plan and expected quality measures.
Software Risk Identification	Identifying and analyzing risks and placing them in risk management plan and/or tool. This includes responding to new risks that occur as project progresses.
Acquisition Monitoring	Overseeing acquisition projects through attendance at key reviews and through reviewing deliverables.
Progress/Earned Value: Tracking	Crediting progress points or earned value as tasks are completed and comparing



<b>Skill</b>	<b>Definition</b>
	actual and planned progress.
Project Status Monitoring/Reporting	Monitoring a project as it progresses for any deviations from the current plan.
Software Risk Monitoring	Monitoring the status of risks and taking appropriate action.
Conducting Milestone Reviews	Preparing review materials and associated deliverables; presenting review and following through on RFAs or RIDs.
Staffing/Team Selection	Understanding of skill mix needed to staff a software project.
Project Process Monitoring	Monitoring the project's work to assure that it is following the process documented by the SMP/PP.
Software Development Environments and Facilities	Having knowledge of development tools used on mission software projects and for any specialized facilities needed (e.g., lab space for flight software).
<b>Systems/Requirement Engineering</b>	
Requirements Management	Managing requirements changes and bidirectional traceability of requirements.
Requirements and Operations Concepts Definition, Analysis, and Validation	Developing high-level requirements and interfaces.
Intergroup Collaboration/Liaison	Managing liaisons with other software groups, hardware groups, flight operation teams, principal investigators and any other relevant collaborators.
COTS/GOTS Evaluation	Defining selection criteria and applying them to candidate products.
Decision Analysis	Systematic approach to defining decision criteria and using them to evaluate alternative options.
Tradeoffs, Tailoring, and Prioritizing	Analysis approaches to taking high-level concepts and developing appropriate system requirements and operational concepts
System Architecture	Understanding capabilities of and

<b>Skill</b>	<b>Definition</b>
	interfaces between hardware and software subsystems.
Prototyping, Analysis, Simulation, and Testing Approaches	Detailed techniques for attaining a better understanding of requirements.
Software Technology Awareness	Having knowledge of trends in the larger software and system development industry and to consider for use on ISD software projects.
<b>Software Design/Implementation</b>	
Software Architecture	Understanding capabilities of and interfaces between software subsystems.
Software Design Methods	Understanding of approaches to creating and documenting the structure of a software system.
COTS/GOTS-Based Design	Understanding design methods applied to systems that primarily are composed of COTS or GOTS products and where the primary work is configuring the products and writing "glue code" as needed to implement interfaces between products.
Software Reliability and Safety	Analytical techniques for attaining safe and reliable systems.
Software Implementation	Building a software system to a software design through coding or configuring software modules.
Programming Languages	Understanding of compiled or interpreted programming or scripting languages.
Reusable Software Development	Techniques specifically oriented towards adapting software from previous missions or using software from a reuse library.
Unit Testing	Testing the functionality of individual software modules to assure they implement the requirements.
Software and System Integration	Assembly of a build from the components of a system.

Skill	Definition
<b>Verification, Validation, and Delivery</b>	
Inspections and Walkthroughs	Understanding how to prepare for and conduct meeting and follow through on identified corrections or action items.
Test Planning	Writing or editing of test plan, test procedures, test cases and test scripts.
Flight and Ground Software Testbeds	Installing flight or ground software into test environment, and configuring simulators and test tools to support system and acceptance testing.
Test Execution and Analysis	Executing tests and determining whether or not they have been successfully passed.
Test Status Reporting and Reviews	Reporting progress of number of tests passed, conducting test readiness reviews and post-acceptance test ATRR.
<b>Organizational Support Activities</b>	
Measurement for Improvement	Using metrics at an organizational level to assess trends in process performance.
Software Assurance	Understanding the disciplines of Software Quality, Software Safety, Software Reliability, Software Verification and Validation, and Independent Verification and Validation (IV&V)
Configuration Management (CM) Planning	Establishing project guidelines, procedures, work instructions and plans for managing and maintaining the CM system for a project. The result is the creation and baseline of the project CM Plan.
CM Identification	Identifying a project's configuration items (CIs) based on the CM Plan.
CM Change Control	Managing a project's CIs based on the CM Plan.
Configuration Status Accounting and Auditing	Identifying and baselining a project's information. Audits are divided into two categories: Functional Configuration Audits (FCAs) and Physical Configuration Audits (PCAs).

<b>Skill</b>	<b>Definition</b>
Process Engineering	Developing or adapting process documentation, software engineering tools, and training material.
Process Deployment	Putting process assets into use via web sites, training classes or mentoring.
Capturing Lessons Learned	Gathering and analyzing data on key project events or outcomes to inform future decisions.

## B.2 Skill Levels

ID	Term	Skill Level Definition
1	Cursory	Level of training that provides enough awareness of a given skill to be able to work with specialists in this skill
2	Proficient	Level of training that enables a person to apply the skill on a project
3	Expert	Level of ability that allows a person to convey or communicate a skill to others (through lecturing, mentoring, or on-the-job training)

### B.3 Software Classes

Within the skills vs. roles matrices presented in Appendix C, these software classes are sometimes referenced. Occasionally the skill level depends upon the software class (e.g., in the areas of safety and reliability). These software class definitions are included here for the convenience of the reader.

Class	Definition (per NPR 7150.2)
Class A: Human-Rated Software Systems	Applies to all space flight software subsystems (ground and flight) developed and/or operated by or for NASA to support human activity in space and that interact with NASA human space flight systems. Space flight system design and associated risks to humans are evaluated over the program's life cycle, including design, development, fabrication, processing, maintenance, launch, recovery, and final disposal. Examples of Class A software for human rated space flight include but are not limited to: guidance; navigation and control; life support systems; crew escape; automated rendezvous and docking; failure detection, isolation and recovery; and mission operations.
Class B: Non-Human Space Rated Software Systems	Flight and ground software that must perform reliably in order to accomplish primary mission objectives. Examples of Class B software for non-human (robotic) spaceflight include, but are not limited to, propulsion systems; power systems; guidance navigation and control; fault protection; thermal systems; command and control ground systems; planetary surface operations; hazard prevention; primary instruments; or other subsystems that could cause the loss of science return from multiple instruments.
Class C: Mission Support Software	Flight or ground software that is necessary for the science return from a single (non-critical) instrument or is used to analyze or process mission data or other software for which a defect could adversely impact attainment of some secondary mission objectives or cause operational problems for which potential work-arounds exist. Examples of Class C software include, but are not limited to, software that supports pre-launch integration and test, mission data processing and analysis, analysis software used in trend analysis and calibration of flight engineering parameters, primary/major science data collection and distribution systems, major Center facilities, data acquisition and control systems, aeronautic applications, or software employed by network

<b>Class</b>	<b>Definition (per NPR 7150.2)</b>
	operations and control (which is redundant with systems used at tracking complexes). Class C software must be developed carefully, but validation and verification effort is generally less intensive than for Class B.
Class D: Analysis and Distribution Software	Non-space flight software. Software developed to perform science data collection, storage, and distribution; or perform engineering and hardware data analysis. A defect in Class D software may cause rework but has no direct impact on mission objectives or system safety. Examples of Class D software include, but are not limited to, software tools; analysis tools, and science data collection and distribution systems.
Class E: Development Support Software	Non-space flight software. Software developed to explore a design concept; or support software or hardware development functions such as requirements management, design, test and integration, configuration management, documentation, or perform science analysis. A defect in Class E software may cause rework but has no direct impact on mission objectives or system safety. Examples of Class E software include, but are not limited to, earth science modeling, information only websites (non-business/information technology); science data analysis; and low technical readiness level research software.
Class F: General Purpose Computing Software (Multi-Center or Multi-Program/Project)	General purpose computing software used in support of the Agency, multiple Centers, or multiple programs/projects, as described for the General Purpose Infrastructure To-Be Component of the NASA Enterprise Architecture, Volume 5 (To-Be Architecture), and for the following portfolios: voice, wide area network, local area network, video, data centers, application services, messaging and collaboration, and public web. A defect in Class F software is likely to affect the productivity of multiple users across several geographic locations, and may possibly affect mission objectives or system safety. Mission objectives can be cost, schedule, or technical objectives for any work that the Agency performs. Examples of Class F software include, but are not limited to, software in support of the NASA-wide area network; the NASA Web portal; and applications supporting the Agency's Integrated Financial Management Program, such as the time and attendance system, Travel Manager, Business Warehouse, and E-Payroll.
Class G: General	General purpose computing software used in support of a

Class	Definition (per NPR 7150.2)
Purpose Computing Software (Single Center or Project)	single Center or project, as described for locally deployed portions of the General Purpose Infrastructure To-Be Component of the NASA Enterprise Architecture, Volume 5 (To-Be Architecture) and for the following portfolios: voice, local area network, video, data centers, application services, messaging and collaboration, and public web. A defect in Class G software is likely to affect the productivity of multiple users in a single geographic location or workgroup, but is unlikely to affect mission objectives or system safety. Examples of Class G software include, but are not limited to, software for Center custom applications such as Headquarters' Corrective Action Tracking System and Headquarters' ODIN New User Request System.
Class H: General Purpose Desktop Software	General purpose desktop software as described for the General Purpose Infrastructure To-Be Component (Desktop Hardware and Software Portfolio) of the NASA Enterprise Architecture, Volume 5 (NASA To-Be Architecture). This class includes software for Wintel, Mac, and Unix desktops as well as laptops. A defect in Class H software may affect the productivity of a single user or small group of users but generally will not affect mission objectives or system safety. However, a defect in desktop IT-security related software, e.g., anti-virus software, may lead to loss of functionality and productivity across multiple users and systems. Examples of Class H software include, but are not limited to, desktop applications such as Microsoft Word, Excel, and Power Point, and Adobe Acrobat.



## Appendix C. Skills vs. Roles Matrices

This appendix contains a matrix of skills for each individual role. For each role, it lists the skill areas and identifies what level of expertise is required (as defined in Appendix B: cursory, proficient, expert). It further maps the skills to various components of the various maturity levels. When the characters A-H appear (rather than an “X”), that particular software class (see Appendix B for definitions) is indicated.

### C.1 Template

This template shows what is in common across all roles.

Skills vs. Roles - Template				Maturity Level 2							Maturity Level 3												ML4		ML5			
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR
Project Management																												
Task Planning (WBS, SMP/PP)				X																X								
Life Cycle Models/Process Tailoring				X																X								
Acquisition Planning				X						X										X		X						
Size and Complexity Estimation				X																								
Software Cost and Schedule Estimation				X																								
Progress/Earned Value: Planning				X																								
Software Risk Identification				X																			X					
Acquisition Monitoring					X					X												X						
Progress/Earned Value: Tracking					X																							
Project Status Monitoring/Reporting					X																							
Software Risk Monitoring					X																		X					
Conducting Milestone Reviews					X																							
Staffing/Team Selection				X	X																							
Project Process Monitoring					X																							

Skills vs. Roles - Template	Maturity Level 2										Maturity Level 3										ML4	ML5							
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR	
Software Development Environments and Facilities				X	X																								
Systems/Requirement Engineering																													
Requirements Management						X																							
Requirements and Operations Concepts Definition, Analysis, and Validation																X													
Intergroup Collaboration/Liaison				X	X															X	X								
COTS/GOTS Evaluation																X													
Decision Analysis																X								X					
Tradeoffs, Tailoring, and Prioritizing																X								X					
System Architecture																X	X												
Prototyping, Analysis, Simulation, and Testing Approaches																X	X												
Software Technology Awareness																X	X	X	X	X									
Software Design/Implementation																													
Software Architecture																X	X												
Software Design Methods																X													
COTS/GOTS-Based Design																X													
Software Reliability and Safety																X	X												
Software Implementation																	X												
Programming Languages																	X												
Reusable Software Development																X	X	X											
Unit Testing																	X		X										
Software and System Integration																		X											
Verification, Validation, and Delivery																													
Inspections and Walkthroughs																X	X	X	X	X									
Test Planning																		X	X										
Flight and Ground Software Testbeds																		X	X										
Test Execution and Analysis																		X	X										

Skills vs. Roles - Template	Maturity Level 2										Maturity Level 3										ML4		ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR
Test Status Reporting and Reviews																		X	X									
Organizational Support Activities																												
Measurement for Project Management				X	X				X																			
Measurement for Improvement									X																			
Software Assurance								X																				
Configuration Management Planning							X																					
CM Identification							X																					
CM Change Control							X																					
Configuration Status Accounting and Auditing							X																					
Process Engineering											X	X	X															
Process Deployment											X	X	X															
Capturing Lessons Learned											X																	

## C.2 Acquisition Manager (AQM)

Skills vs. Roles – Acquisition Manager (AQM)	Maturity Level 2										Maturity Level 3										ML4		ML5						
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR	
Project Management																													
Task Planning (WBS, SMP/PP)		X		X																X									
Life Cycle Models/Process Tailoring		X		X																X									
Acquisition Planning			X	X						X										X		X							
Size and Complexity Estimation		X		X																									
Software Cost and Schedule Estimation		X		X																									
Progress/Earned Value: Planning		X		X																									
Software Risk Identification		X		X																			X						
Acquisition Monitoring			X		X					X												X							
Progress/Earned Value: Tracking		X			X																								
Project Status Monitoring/Reporting		X			X																								
Software Risk Monitoring		X			X																		X						
Conducting Milestone Reviews		X			X																								
Staffing/Team Selection		X		X	X																								
Project Process Monitoring		X			X																								
Software Development Environments and Facilities	X			X	X																								
Systems/Requirement Engineering																													
Requirements Management	X					X																							
Requirements and Operations Concepts Definition, Analysis, and Validation	X														X														
Intergroup Collaboration/Liaison	X			X	X															X	X								
COTS/GOTS Evaluation	X														X														
Decision Analysis	X														X									X					

Skills vs. Roles – Acquisition Manager (AQM)	Maturity Level 2										Maturity Level 3										ML4		ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR
Tradeoffs, Tailoring, and Prioritizing		X													X								X					
System Architecture		X													X	X												
Prototyping, Analysis, Simulation, and Testing Approaches		X													X	X												
Software Technology Awareness	X														X	X	X	X	X									
Software Design/Implementation																												
Software Architecture	X														X	X												
Software Design Methods	X														X													
COTS/GOTS-Based Design	X														X													
Software Reliability and Safety	X														X	X												
Software Implementation	X															X												
Programming Languages	X															X												
Reusable Software Development	X														X	X	X											
Unit Testing	X															X		X										
Software and System Integration		X															X											
Verification, Validation, and Delivery																												
Inspections and Walkthroughs	X														X	X	X	X	X									
Test Planning	X																	X	X									
Flight and Ground Software Testbeds	X																	X	X									
Test Execution and Analysis	X																	X	X									
Test Status Reporting and Reviews	X																	X	X									
Organizational Support Activities																												
Measurement for Project Management		X		X	X				X																			
Measurement for Improvement	X								X																			
Software Assurance	X							X																				
Configuration Management Planning	X						X																					
CM Identification	X						X																					
CM Change Control	X						X																					

Skills vs. Roles – Acquisition Manager (AQM)	CURS	PROF	EXP	Maturity Level 2							Maturity Level 3										ML4		ML5				
				PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID
Configuration Status Accounting and Auditing	X						X																				
Process Engineering	X										X	X	X														
Process Deployment	X										X	X	X														
Capturing Lessons Learned		X									X																

### C.3 Configuration Management Officer (CMO)

Skills vs. Roles – Configuration Management Officer (CMO)	Maturity Level 2										Maturity Level 3										ML4		ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR
Project Management																												
Task Planning (WBS, SMP/PP)	X			X																X								
Life Cycle Models/Process Tailoring		X		X																X								
Acquisition Planning				X						X										X		X						
Size and Complexity Estimation				X																								
Software Cost and Schedule Estimation				X																								
Progress/Earned Value: Planning				X																								
Software Risk Identification				X																			X					
Acquisition Monitoring					X					X												X						
Progress/Earned Value: Tracking					X																							
Project Status Monitoring/Reporting					X																							
Software Risk Monitoring					X																		X					
Conducting Milestone Reviews		X			X																							
Staffing/Team Selection				X	X																							
Project Process Monitoring		X			X																							
Software Development Environments and Facilities		X		X	X																							
Systems/Requirement Engineering																												
Requirements Management	X					X																						
Requirements and Operations Concepts Definition, Analysis, and Validation															X													
Intergroup Collaboration/Liaison	X			X	X															X	X							
COTS/GOTS Evaluation															X													
Decision Analysis															X								X					

Skills vs. Roles – Configuration Management Officer (CMO)	Maturity Level 2										Maturity Level 3										ML4		ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR
Tradeoffs, Tailoring, and Prioritizing															X								X					
System Architecture															X	X												
Prototyping, Analysis, Simulation, and Testing Approaches															X	X												
Software Technology Awareness	X														X	X	X	X	X									
Software Design/Implementation																												
Software Architecture	X														X	X												
Software Design Methods	X														X													
COTS/GOTS-Based Design	X														X													
Software Reliability and Safety															X	X												
Software Implementation	X															X												
Programming Languages																X												
Reusable Software Development	X														X	X	X											
Unit Testing																X		X										
Software and System Integration		X															X											
Verification, Validation, and Delivery																												
Inspections and Walkthroughs															X	X	X	X	X									
Test Planning																		X	X									
Flight and Ground Software Testbeds																		X	X									
Test Execution and Analysis																		X	X									
Test Status Reporting and Reviews																		X	X									
Organizational Support Activities																												
Measurement for Project Management				X	X				X																			
Measurement for Improvement									X																			
Software Assurance								X																				
Configuration Management Planning			X				X																					
CM Identification			X				X																					
CM Change Control			X				X																					



Skills vs. Roles – Configuration Management Officer (CMO)	Maturity Level 2											Maturity Level 3											ML4		ML5			
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR
Configuration Status Accounting and Auditing			X				X																					
Process Engineering											X	X	X															
Process Deployment	X										X	X	X															
Capturing Lessons Learned											X																	

## C.4 Development Engineer (DE)

Skills vs. Roles – Development Engineer (DE)	Maturity Level 2										Maturity Level 3										ML4	ML5						
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR
Project Management																												
Task Planning (WBS, SMP/PP)				X																X								
Life Cycle Models/Process Tailoring				X																X								
Acquisition Planning				X						X										X		X						
Size and Complexity Estimation				X																								
Software Cost and Schedule Estimation				X																								
Progress/Earned Value: Planning				X																								
Software Risk Identification				X																			X					
Acquisition Monitoring					X					X												X						
Progress/Earned Value: Tracking					X																							
Project Status Monitoring/Reporting					X																							
Software Risk Monitoring					X																		X					
Conducting Milestone Reviews	X				X																							
Staffing/Team Selection				X	X																							
Project Process Monitoring					X																							
Software Development Environments and Facilities	X			X	X																							
Systems/Requirement Engineering																												
Requirements Management						X																						
Requirements and Operations Concepts Definition, Analysis, and Validation	X														X													
Intergroup Collaboration/Liaison				X	X															X	X							
COTS/GOTS Evaluation	X														X													
Decision Analysis															X									X				
Tradeoffs, Tailoring, and Prioritizing	X														X									X				

Skills vs. Roles – Development Engineer (DE)	Maturity Level 2										Maturity Level 3										ML4		ML5						
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR	
System Architecture															X	X													
Prototyping, Analysis, Simulation, and Testing Approaches		X													X	X													
Software Technology Awareness	X														X	X	X	X	X										
Software Design/Implementation																													
Software Architecture	X														X	X													
Software Design Methods		X													X														
COTS/GOTS-Based Design	X														X														
Software Reliability and Safety	X														X	X													
Software Implementation		X														X													
Programming Languages		X														X													
Reusable Software Development		X													X	X	X												
Unit Testing		X														X		X											
Software and System Integration		X															X												
Verification, Validation, and Delivery																													
Inspections and Walkthroughs		X													X	X	X	X	X										
Test Planning	X																	X	X										
Flight and Ground Software Testbeds	X																	X	X										
Test Execution and Analysis	X																	X	X										
Test Status Reporting and Reviews	X																	X	X										
Organizational Support Activities																													
Measurement for Project Management	X			X	X				X																				
Measurement for Improvement									X																				
Software Assurance								X																					
Configuration Management Planning	X						X																						
CM Identification	X						X																						
CM Change Control		X					X																						
Configuration Status Accounting and Auditing	X						X																						

											Maturity Level 2					Maturity Level 3										ML4		ML5										
Skills vs. Roles – Development Engineer (DE)											CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR
Process Engineering																					X	X	X															
Process Deployment											X										X	X	X															
Capturing Lessons Learned																					X																	

## C.5 Development Team Lead (DTL)

Skills vs. Roles – Development Team Lead (DTL)	Maturity Level 2											Maturity Level 3											ML4	ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR	
Project Management																													
Task Planning (WBS, SMP/PP)	X			X																X									
Life Cycle Models/Process Tailoring	X			X																X									
Acquisition Planning				X						X										X		X							
Size and Complexity Estimation	X			X																									
Software Cost and Schedule Estimation		X		X																									
Progress/Earned Value: Planning		X		X																									
Software Risk Identification	X			X																			X						
Acquisition Monitoring					X					X												X							
Progress/Earned Value: Tracking		X			X																								
Project Status Monitoring/Reporting		X			X																								
Software Risk Monitoring	X				X																		X						
Conducting Milestone Reviews		X			X																								
Staffing/Team Selection	X			X	X																								
Project Process Monitoring					X																								
Software Development Environments and Facilities	X			X	X															X									
Systems/Requirement Engineering																													
Requirements Management	X					X																							
Requirements and Operations Concepts Definition, Analysis, and Validation		X														X													
Intergroup Collaboration/Liaison	X			X	X															X	X								
COTS/GOTS Evaluation		X														X													
Decision Analysis		X														X								X					
Tradeoffs, Tailoring, and Prioritizing		X														X								X					

Skills vs. Roles – Development Team Lead (DTL)	Maturity Level 2										Maturity Level 3										ML4		ML5						
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR	
System Architecture		X													X	X													
Prototyping, Analysis, Simulation, and Testing Approaches		X													X	X													
Software Technology Awareness	X														X	X	X	X	X										
Software Design/Implementation																													
Software Architecture			X												X	X													
Software Design Methods			X												X														
COTS/GOTS-Based Design		X													X														
Software Reliability and Safety		X	B												X	X													
Software Implementation			X													X													
Programming Languages		X														X													
Reusable Software Development		X													X	X	X												
Unit Testing			X													X		X											
Software and System Integration		X															X												
Verification, Validation, and Delivery																													
Inspections and Walkthroughs			X												X	X	X	X	X										
Test Planning	X																	X	X										
Flight and Ground Software Testbeds	X																	X	X										
Test Execution and Analysis	X																	X	X										
Test Status Reporting and Reviews	X																	X	X										
Organizational Support Activities																													
Measurement for Project Management		X		X	X				X																				
Measurement for Improvement									X																				
Software Assurance								X																					
Configuration Management Planning	X						X																						
CM Identification	X						X																						
CM Change Control		X					X																						
Configuration Status Accounting and Auditing	X						X																						

											Maturity Level 2					Maturity Level 3										ML4		ML5											
Skills vs. Roles – Development Team Lead (DTL)											CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR	
Process Engineering																					X	X	X																
Process Deployment											X										X	X	X																
Capturing Lessons Learned											X										X																		

## **C.6 Lab Manager (FSW-specific) (LM)**

[TBD]



## **C.7 Maintenance Engineer (ME)**

[TBD]

## **C.8 Line Manager (MGR)**

[TBD]

## **C.9 Maintenance Team Lead (MTL)**

[TBD]

## C.10 Product Development Lead (PDL)

Skills vs. Roles – Product Development Lead (PDL)	Maturity Level 2										Maturity Level 3										ML4	ML5						
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR
Project Management																												
Task Planning (WBS, SMP/PP)		X		X																X								
Life Cycle Models/Process Tailoring		X		X																X								
Acquisition Planning	X			X						X										X		X						
Size and Complexity Estimation		X		X																								
Software Cost and Schedule Estimation		X		X																								
Progress/Earned Value: Planning			X	X																								
Software Risk Identification		X		X																			X					
Acquisition Monitoring	X				X					X												X						
Progress/Earned Value: Tracking			X		X																							
Project Status Monitoring/Reporting			X		X																							
Software Risk Monitoring			X		X																		X					
Conducting Milestone Reviews			X		X																							
Staffing/Team Selection		X		X	X																							
Project Process Monitoring			X		X																							
Software Development Environments and Facilities		X		X	X																							
Systems/Requirement Engineering																												
Requirements Management			X			X																						
Requirements and Operations Concepts Definition, Analysis, and Validation		X													X													
Intergroup Collaboration/Liaison		X		X	X															X	X							
COTS/GOTS Evaluation	X														X													
Decision Analysis		X													X									X				
Tradeoffs, Tailoring, and Prioritizing		X													X									X				

Skills vs. Roles – Product Development Lead (PDL)	Maturity Level 2										Maturity Level 3										ML4		ML5						
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR	
System Architecture		X													X	X													
Prototyping, Analysis, Simulation, and Testing Approaches		X													X	X													
Software Technology Awareness	X														X	X	X	X	X										
Software Design/Implementation																													
Software Architecture			X												X	X													
Software Design Methods	X														X														
COTS/GOTS-Based Design	X														X														
Software Reliability and Safety	X	B													X	X													
Software Implementation	X															X													
Programming Languages	X															X													
Reusable Software Development	X														X	X	X												
Unit Testing	X															X		X											
Software and System Integration	X																X												
Verification, Validation, and Delivery																													
Inspections and Walkthroughs	X														X	X	X	X	X										
Test Planning	X																	X	X										
Flight and Ground Software Testbeds	X	B																X	X										
Test Execution and Analysis	X																	X	X										
Test Status Reporting and Reviews	X																	X	X										
Organizational Support Activities																													
Measurement for Project Management			X	X	X				X																				
Measurement for Improvement	X								X																				
Software Assurance	X							X																					
Configuration Management Planning		X					X																						
CM Identification	X						X																						
CM Change Control		X					X																						
Configuration Status Accounting and Auditing	X						X																						

Skills vs. Roles – Product Development Lead (PDL)	Maturity Level 2										Maturity Level 3										ML4		ML5						
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR	
Process Engineering	X										X	X	X																
Process Deployment	X										X	X	X																
Capturing Lessons Learned		X									X																		

## **C.11 Process Engineer (PE)**

[TBD]

## **C.12 System Engineer (SE)**

[TBD]



## C.13 Software Manager (SM)

Skills vs. Roles – Software Manager (SM)	Maturity Level 2										Maturity Level 3										ML4		ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR
Project Management																												
Task Planning (WBS, SMP/PP)			X	X																X								
Life Cycle Models/Process Tailoring			X	X																X								
Acquisition Planning			X	X					X											X		X						
Size and Complexity Estimation			X	X																								
Software Cost and Schedule Estimation			X	X																								
Progress/Earned Value: Planning			X	X																								
Software Risk Identification			X	X																		X						
Acquisition Monitoring			X		X				X													X						
Progress/Earned Value: Tracking			X		X																							
Project Status Monitoring/Reporting			X		X																							
Software Risk Monitoring			X		X																	X						
Conducting Milestone Reviews			X		X																							
Staffing/Team Selection			X	X	X																							
Project Process Monitoring		X			X																							
Software Development Environments and Facilities		X		X	X																							
Systems/Requirement Engineering																												
Requirements Management			X			X																						
Requirements and Operations Concepts Definition, Analysis, and Validation			X												X													
Intergroup Collaboration/Liaison			X	X	X															X	X							
COTS/GOTS Evaluation		X													X													
Decision Analysis			X												X								X					

Skills vs. Roles – Software Manager (SM)	Maturity Level 2										Maturity Level 3										ML4		ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR
Tradeoffs, Tailoring, and Prioritizing			X												X								X					
System Architecture			X												X	X												
Prototyping, Analysis, Simulation, and Testing Approaches		X													X	X												
Software Technology Awareness		X													X	X	X	X	X									
Software Design/Implementation																												
Software Architecture		X													X	X												
Software Design Methods	X														X													
COTS/GOTS-Based Design	X														X													
Software Reliability and Safety	X														X	X												
Software Implementation	X															X												
Programming Languages	X															X												
Reusable Software Development	X														X	X	X											
Unit Testing		X														X		X										
Software and System Integration		X															X											
Verification, Validation, and Delivery																												
Inspections and Walkthroughs	X														X	X	X	X	X									
Test Planning	X																	X	X									
Flight and Ground Software Testbeds	X																	X	X									
Test Execution and Analysis	X																	X	X									
Test Status Reporting and Reviews	X																	X	X									
Organizational Support Activities																												
Measurement for Project Management		X		X	X				X																			
Measurement for Improvement	X								X																			
Software Assurance	X							X																				
Configuration Management Planning	X						X																					
CM Identification	X						X																					
CM Change Control	X						X																					

Skills vs. Roles – Software Manager (SM)	CURS	PROF	EXP	Maturity Level 2							Maturity Level 3										ML4		ML5				
				PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID
Configuration Status Accounting and Auditing	X						X																				
Process Engineering											X	X	X														
Process Deployment	X										X	X	X														
Capturing Lessons Learned		X									X																

## C.14 Software Quality Engineer (SQE)

Skills vs. Roles – Software Quality Engineer (SQE)	Maturity Level 2										Maturity Level 3										ML4		ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR
Project Management																												
Task Planning (WBS, SMP/PP)				X																X								
Life Cycle Models/Process Tailoring		X		X																X								
Acquisition Planning				X						X										X		X						
Size and Complexity Estimation				X																								
Software Cost and Schedule Estimation				X																								
Progress/Earned Value: Planning				X																								
Software Risk Identification				X																			X					
Acquisition Monitoring					X					X												X						
Progress/Earned Value: Tracking					X																							
Project Status Monitoring/Reporting					X																							
Software Risk Monitoring					X																		X					
Conducting Milestone Reviews			X		X																							
Staffing/Team Selection				X	X																							
Project Process Monitoring			X		X																							
Software Development Environments and Facilities	X			X	X																							
Systems/Requirement Engineering																												
Requirements Management		X				X																						
Requirements and Operations Concepts Definition, Analysis, and Validation															X													
Intergroup Collaboration/Liaison				X	X															X	X							
COTS/GOTS Evaluation															X													
Decision Analysis															X									X				

Skills vs. Roles – Software Quality Engineer (SQE)	Maturity Level 2										Maturity Level 3										ML4		ML5					
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR
Tradeoffs, Tailoring, and Prioritizing															X								X					
System Architecture	X														X	X												
Prototyping, Analysis, Simulation, and Testing Approaches															X	X												
Software Technology Awareness															X	X	X	X	X									
Software Design/Implementation																												
Software Architecture	X														X	X												
Software Design Methods															X													
COTS/GOTS-Based Design															X													
Software Reliability and Safety															X	X												
Software Implementation																X												
Programming Languages																X												
Reusable Software Development															X	X	X											
Unit Testing																X		X										
Software and System Integration	X																X											
Verification, Validation, and Delivery																												
Inspections and Walkthroughs		X													X	X	X	X	X									
Test Planning	X																	X	X									
Flight and Ground Software Testbeds	X																	X	X									
Test Execution and Analysis		X																X	X									
Test Status Reporting and Reviews		X																X	X									
Organizational Support Activities																												
Measurement for Project Management		X		X	X				X																			
Measurement for Improvement									X																			
Software Assurance			X					X																				
Configuration Management Planning	X						X																					
CM Identification							X																					
CM Change Control		X					X																					

Skills vs. Roles – Software Quality Engineer (SQE)	CURS	PROF	EXP	Maturity Level 2							Maturity Level 3											ML4		ML5			
				PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID
Configuration Status Accounting and Auditing		X					X																				
Process Engineering											X	X	X														
Process Deployment		X									X	X	X														
Capturing Lessons Learned	X										X																

## **C.15 Simulator/Tools Engineer (STE)**

[TBD]

## **C.16 Software Technology Researcher (STR)**

[TBD]



## C.17 Test Engineer (TE)

Skills vs. Roles – Test Engineer (TE)	Maturity Level 2										Maturity Level 3										ML4	ML5							
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR	
Project Management																													
Task Planning (WBS, SMP/PP)				X																X									
Life Cycle Models/Process Tailoring				X																X									
Acquisition Planning				X						X										X		X							
Size and Complexity Estimation				X																									
Software Cost and Schedule Estimation				X																									
Progress/Earned Value: Planning				X																									
Software Risk Identification				X																			X						
Acquisition Monitoring					X					X												X							
Progress/Earned Value: Tracking					X																								
Project Status Monitoring/Reporting					X																								
Software Risk Monitoring					X																		X						
Conducting Milestone Reviews	X				X																								
Staffing/Team Selection				X	X																								
Project Process Monitoring					X																								
Software Development Environments and Facilities	X			X	X																								
Systems/Requirement Engineering																													
Requirements Management	X					X																							
Requirements and Operations Concepts Definition, Analysis, and Validation	X														X														
Intergroup Collaboration/Liaison				X	X															X	X								
COTS/GOTS Evaluation															X														
Decision Analysis															X									X					
Tradeoffs, Tailoring, and Prioritizing															X									X					

Skills vs. Roles – Test Engineer (TE)	Maturity Level 2														Maturity Level 3										ML4		ML5	
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR
System Architecture	X														X	X												
Prototyping, Analysis, Simulation, and Testing Approaches		X													X	X												
Software Technology Awareness															X	X	X	X	X									
<b>Software Design/Implementation</b>																												
Software Architecture	X														X	X												
Software Design Methods															X													
COTS/GOTS-Based Design															X													
Software Reliability and Safety	X														X	X												
Software Implementation																X												
Programming Languages																X												
Reusable Software Development															X	X	X											
Unit Testing																X		X										
Software and System Integration	X																X											
<b>Verification, Validation, and Delivery</b>																												
Inspections and Walkthroughs		X													X	X	X	X	X									
Test Planning		X																X	X									
Flight and Ground Software Testbeds		X																X	X									
Test Execution and Analysis		X																X	X									
Test Status Reporting and Reviews		X																X	X									
<b>Organizational Support Activities</b>																												
Measurement for Project Management	X			X	X				X																			
Measurement for Improvement									X																			
Software Assurance								X																				
Configuration Management Planning	X						X																					
CM Identification	X						X																					
CM Change Control		X					X																					
Configuration Status Accounting and Auditing	X						X																					

												Maturity Level 2					Maturity Level 3										ML4		ML5										
Skills vs. Roles – Test Engineer (TE)												CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR
Process Engineering																						X	X	X															
Process Deployment												X										X	X	X															
Capturing Lessons Learned																						X																	

## C.18 Test Team Lead (TTL)

Skills vs. Roles – Test Team Lead (TTL)	Maturity Level 2											Maturity Level 3											ML4	ML5				
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID	CAR
Project Management																												
Task Planning (WBS, SMP/PP)	X			X																X								
Life Cycle Models/Process Tailoring	X			X																X								
Acquisition Planning				X						X										X		X						
Size and Complexity Estimation	X			X																								
Software Cost and Schedule Estimation		X		X																								
Progress/Earned Value: Planning		X		X																								
Software Risk Identification	X			X																			X					
Acquisition Monitoring					X					X												X						
Progress/Earned Value: Tracking		X			X																							
Project Status Monitoring/Reporting		X			X																							
Software Risk Monitoring	X				X																		X					
Conducting Milestone Reviews		X			X																							
Staffing/Team Selection	X			X	X																							
Project Process Monitoring					X																							
Software Development Environments and Facilities	X			X	X															X								
Systems/Requirement Engineering																												
Requirements Management	X					X																						
Requirements and Operations Concepts Definition, Analysis, and Validation	X															X												
Intergroup Collaboration/Liaison	X			X	X															X	X							
COTS/GOTS Evaluation																X												
Decision Analysis																X								X				
Tradeoffs, Tailoring, and Prioritizing																X								X				

Skills vs. Roles – Test Team Lead (TTL)	Maturity Level 2										Maturity Level 3										ML4		ML5						
	CURS	PROF	EXP	PP	PMC	REQM	CM	PPQA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	OPM	OID	CAR	
System Architecture	X														X	X													
Prototyping, Analysis, Simulation, and Testing Approaches		X													X	X													
Software Technology Awareness	X														X	X	X	X	X										
Software Design/Implementation																													
Software Architecture		X													X	X													
Software Design Methods	X														X														
COTS/GOTS-Based Design	X														X														
Software Reliability and Safety	X														X	X													
Software Implementation	X															X													
Programming Languages																X													
Reusable Software Development	X														X	X	X												
Unit Testing																X		X											
Software and System Integration	X																X												
Verification, Validation, and Delivery																													
Inspections and Walkthroughs		X													X	X	X	X	X										
Test Planning		X																X	X										
Flight and Ground Software Testbeds		X																X	X										
Test Execution and Analysis			X															X	X										
Test Status Reporting and Reviews		X																X	X										
Organizational Support Activities																													
Measurement for Project Management	X			X	X				X																				
Measurement for Improvement									X																				
Software Assurance								X																					
Configuration Management Planning	X						X																						
CM Identification	X						X																						
CM Change Control		X					X																						
Configuration Status Accounting and Auditing	X						X																						

Skills vs. Roles – Test Team Lead (TTL)	CURS	PROF	EXP	Maturity Level 2							Maturity Level 3										ML4		ML5				
				PP	PMC	REQM	CM	PPOA	MA	SAM	OPF	OPD	OT	OEI	RD	TS	PI	VER	VAL	IPM	IT	ISM	RSKM	DAR	OPP	QPM	OID
Process Engineering											X	X	X														
Process Deployment	X										X	X	X														
Capturing Lessons Learned	X										X																

## Appendix D. Course/Module Descriptions

Note: The descriptions in this Appendix have been drafted from e-mails, on-line descriptions, and a variety of sources. Ultimately this material should be extracted from the training database.

### D.1 Training Course/Module Descriptions

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Title:	Defining Software Processes
ID:	SEI001
Funding Source:	[TBD]
Provider/Instructor:	SEI
Duration:	3 days
Description:	[TBS]

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Title:	Defining World Class Processes
ID:	QIC001
Funding Source:	NASA/HQ
Provider/Instructor:	Tim Olson
Duration:	5 days
Description:	[TBS]

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Title:	Earned Value (Progress Tracking with Earned Value or Point Counting)
ID:	ISD001
Funding Source:	GSFC/EPG
Provider/Instructor:	ISD-EPG
Duration:	[TBD]
Description:	This course presents Earned Value strategies and methods for the first time user of the Excel-based workbook tool. For more details see: <a href="http://software.gsfc.nasa.gov/training.htm">http://software.gsfc.nasa.gov/training.htm</a>

---

Title: Foundations of Project Management  
ID: APPL001  
Funding Source: NASA/HQ  
Provider/Instructor: NASA/APPL  
Duration: 5 days

Description:

This course provides interesting and relevant instruction of the methodologies, techniques, terms and guidelines used to manage cost, schedules and technical aspects through the life cycle of a project. The course is invaluable for project control and support personnel who need a better grasp of the project world. For more details see: <http://ohr.gsfc.nasa.gov/DevGuide/Home.htm>

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Title: FSW Developer Training  
ID: FSW001  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

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Title: FSW Development Lead Training  
ID: FSW002  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

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Title: FSW Manager Training  
ID: FSW003  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

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Title: FSW Process Awareness  
ID: FSW010  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

---

Title: FSW Sustaining Engineering Preparation Training  
ID: FSW005  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

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Title: FSW System Engineering Training  
ID: FSW006  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

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Title: FSW Test Lead Training  
ID: FSW007  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

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Title: FSW Tester Training  
ID: FSW008  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

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Title: FSW SPI Deployment Plan Presentation  
ID: FSW004  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: [TBD]  
Description: [TBS]

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Title: Intermediate CMMI  
ID: SEI002  
Funding Source: NASA/HQ  
Provider/Instructor: SEI  
Duration: 5 days  
Description:

The *Intermediate Concepts of Capability Maturity Model-Integrated (CMMI)* course provides participants with a deeper understanding of the CMM<sup>®</sup>-Integrated Model and its fundamental concepts. The course discussion emphasizes deep understanding of the five maturity levels and the grouping of process areas (PAs) and of the six capability levels and the categories of PAs. The course is based on Version 1.0 of the CMMI SE/SW released in summer of 2000.

This course describes a framework that organizations can use to determine their ability to develop and maintain well-engineered systems; it is a model for organizational improvement. The course is composed of lectures and class exercises with ample opportunity for participant demonstration, questions, and discussions.

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Title: Introduction to Flight Software  
ID: FSW009  
Funding Source: [TBD]  
Provider/Instructor: ISD-FSB  
Duration: 4 hours  
Description: [TBS]

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Title: Introduction to Software Acquisition (SA)-CMM  
ID: SEI003  
Funding Source: NASA/HQ  
Provider/Instructor: SEI  
Duration: 2.5 days

Description:

This course introduces those responsible for the acquisition of software-intensive systems, software products, and services to the CMM: for Software Acquisition (SA-CMM) and its fundamental concepts as well as the value it can bring to organizations using it. The SA-CMM is a process improvement model based on the processes and practices of organizations that successfully acquire software-intensive systems, products, and services. It describes the key elements of managing acquisition processes and outlines an improvement path that enables an organization using it to improve its process of acquiring systems. The SA-CMM primarily is used in an organization to improve acquisition processes and to benchmark acquisition process capability and performance.

The course is composed of lectures and class exercises with ample opportunity for participant questions and discussions. After attending the course, participants will be able to understand and demonstrate how the use of the SA-CMM for process improvement can be applied to a variety of acquisition activities.

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Title: Introduction to the CMMI  
ID: SEI004  
Funding Source: NASA/HQ  
Provider/Instructor: CSM  
Duration: 3 days

Description:

The SEI Capability Maturity Model Integration (CMMI<sup>SM</sup>) describes a framework that organizations can use to determine their ability to develop and maintain systems. This framework provides guidance for improving an organization's processes and its ability

to manage the development, acquisition and maintenance of products and services. A four-hour briefing introduces participants to the CMMI<sup>SM</sup>. It provides a high level overview of the model and a basic understanding of the model's two representations: staged and continuous and their relationship to maturity and capability levels.

Topics include: CMMI<sup>SM</sup> background; CMMI<sup>SM</sup> principles; Process maturity and the relationship to process areas; Maturity Level 2 process areas; and Maturity Level 3 process areas (optional). This course is structured to allow ample opportunity for participant questions and discussions. Primary focus is on achieving an understanding of the CMMI<sup>SM</sup> model architecture and a good understanding of Maturity Level 2 process areas. As time allows, Maturity level 3 process areas will also be addressed.

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Title:	ISD Configuration Management
ID:	ISD017
Funding Source:	[TBD]
Provider/Instructor:	ISD
Duration:	[TBD]
Description:	[TBS]

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Title:	ISD Metrics
ID:	ISD018
Funding Source:	[TBD]
Provider/Instructor:	ISD
Duration:	[TBD]
Description:	[TBS]

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Title:	ISD Process Overview
ID:	ISD015
Funding Source:	[TBD]
Provider/Instructor:	ISD
Duration:	[TBD]
Description:	[TBS]

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Title:	ISD Quality Assurance Guidelines
ID:	ISD005
Funding Source:	[TBD]
Provider/Instructor:	[TBD]
Duration:	[TBD]
Description:	[TBS - This is an overview of how ISD personnel interact with the Code 300 SQEs.]

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Title:	Managing Technological Change
ID:	SEI005
Funding Source:	[TBD]
Provider/Instructor:	SEI
Duration:	3 days
Description:	[TBS]

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Title:	Mastering Process Improvement
ID:	SEI006
Funding Source:	NASA/HQ
Provider/Instructor:	SEI
Duration:	5 days
Description:	

*Mastering Process Improvement* presents a structured compendium of best practices in CMM-based process improvement. This course addresses the intertwined challenges facing change agents. These challenges include both technical issues (e.g., process and metrics) and social issues (e.g., resistance, buy-in, and institutionalization). The course presents an approach to CMM-based process improvement called the Process Change Methodology (PCM). The PCM focuses on process improvement activities that occur following a CMM-Based Appraisal. There is a special emphasis on how new SEPGs can work towards achieving Maturity Level 2 while positioning the organization for the future challenges of Maturity Level 3.

There are eight stages to the PCM: organize and prepare; conduct organizational scan; establish technical working groups; understand project's current state; redesign the process; develop the whole product solution; conduct pilot(s) and evaluate; and facilitate organizational learning. Each of these stages consists of activities that the SEPG implements to accelerate broad adoption of new processes and technologies that support CMM goals.

Attendees will receive lectures on each stage of the PCM with focus on techniques and skills that are enablers for success. Each module includes an exercise where individuals and/or small groups of students will work with PCM tools and instruments to address process improvement scenarios and practice new skills. Course modules will conclude with a debriefing of the exercise with presentations and a discussion of the primary issues.

The concepts, techniques, experiences, and examples described in the course are drawn from numerous client partnerships between the Software Engineering Institute (SEI) and organizations in government and industry.

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Title:	Mastering the Requirements Process
ID:	SQE001
Funding Source:	[TBD]
Provider/Instructor:	SQE
Duration:	3 days
Description:	[TBS]

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Title:	Mentor Training
ID:	ISD016
Funding Source:	[TBD]
Provider/Instructor:	ISD
Duration:	[TBD]
Description:	[TBS]

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Title:	Mission Software for Project Managers
ID:	ISD003
Funding Source:	[TBD]
Provider/Instructor:	EPG
Duration:	4 hours

Description:

This course presents an overview of mission software especially the interaction between the software development project and the larger Project organized by a project timeline.

Formulation phase concepts include key early decisions that can set a Project on the right course; project management considerations; mission software architecture and requirements; acquisition; cost estimation; and software-related trades.

Development phase concepts include software development considerations (software development life cycle, reviews, inspections and walkthroughs, testing considerations, and assurance considerations); managing software development (project planning, risk management, project monitoring and control, and post development support); improvement initiatives (including the Software Process Improvement Project); and recommendations for mission success for both software developers and Project management.

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Title:	Mission Software Risk Management
ID:	ISD004
Funding Source:	[TBD]
Provider/Instructor:	ISD-EPG, FSB
Duration:	[TBD]
Description:	[TBS]

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Title:	Overview of the CMMI
ID:	CSM002
Funding Source:	NASA/HQ
Provider/Instructor:	CSM
Duration:	4 hours

Description:

The SEI CMMI describes a framework that organizations can use to determine their ability to develop and maintain systems. This framework provides guidance for improving an organization's processes and its ability to manage the development, acquisition and maintenance of products and services.

This four-hour briefing introduces participants to the CMMI. It provides a high level overview of the model and a basic understanding of the model's staged and continuous representations and their relationship to maturity and capability levels.

Topics to be covered include CMMI background, CMMI principles, process maturity and the relationship to process areas, maturity Level 2 process areas, and maturity Level 3 process areas (optional).

This course is structured to allow ample opportunity for participant questions and discussions. Primary focus is on achieving an understanding of the CMMI<sup>SM</sup> model architecture and a good understanding of Maturity Level 2 process areas. As time allows, Maturity Level 3 process areas will also be addressed.

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Title:	Project Monitoring and Control
ID:	ISD006
Funding Source:	[TBD]
Provider/Instructor:	[TBD]
Duration:	[TBD]
Description:	[TBS]

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Title:	Project Planning
ID:	ISD007
Funding Source:	[TBD]
Provider/Instructor:	[TBD]
Duration:	[TBD]
Description:	[TBS]

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Title:	Quantitative Software Management
ID:	JPL001
Funding Source:	GSFC/EPG
Provider/Instructor:	JPL/CSC (Jairus Hihn/Bill Decker)
Duration:	2 days

Description:

This course trains software managers on the generation of software cost estimates and the use of software metrics in managing their software development activities. Cost estimation topics covered include software estimating methods and models, software development estimation, software development metrics, cost drivers, productivity, common errors in software estimation, rules of thumb, software productivity databases, and risk reduction and mitigation. The project measurement part of the class covers a variety of basic measures that are used to monitor software development including metrics for tracking growth and stability, resources and cost, schedule and progress, and quality. Additionally the class discusses how to analyze the measures, as well as how to plan for project/task monitoring.

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Title: Requirements Engineering Workshop  
ID: HQ001  
Funding Source: NASA/HQ, OCE  
Provider/Instructor: Ivy Hooks  
Duration: 3-4 days  
Description: [TBS]

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Title: Requirements Management Workshop  
ID: ISD008  
Funding Source: [TBD]  
Provider/Instructor: Teraquest  
Duration: 2 days  
Description: [TBS]

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Title: Risk Management  
ID: GSFC001  
Funding Source: NASA/HQ  
Provider/Instructor: NASA/GSFC  
Duration: 2 days  
Description:

This course familiarizes the student with the fundamentals of Continuous Risk Management (CRM) and provides for interactive learning through the use of various methods and tools and a hypothetical space flight project case study. The second day is dedicated to organization-specific activities that will:

1. Establish an organization-specific risk baseline;
2. Practice the functions of CRM paradigm;
3. Promote teambuilding and a more cohesive work environment; and
4. Provide risk information that can be acted on immediately upon completion of the course.

Emphasis can be placed on the creation of Risk Management Plan as deemed necessary by each organization. For more details see: <http://ohr.gsfc.nasa.gov/DevGuide/Home.htm>

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Title: SEPG/EPG Workshop  
ID: CSM003  
Funding Source: NASA/HQ, OCE  
Provider/Instructor: CSM  
Duration: 2 days  
Description: [TBS]

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Title: Software Configuration Management (CM)  
ID: HQ002  
Funding Source: NASA/HQ, OCE  
Provider/Instructor: Teraquest  
Duration: 2 days

Description:

Topics include problems addressed by CM; definitions and purpose of CM; roles, activities, and artifacts for CM; techniques for CM; baselines, audits, and reports; change control boards and procedures; defect tracking; verification of CM efforts; establishing a CM process; managing multiple releases and platforms; and IEEE standards for CM planning. This course is valuable for anyone responsible for configuration management or for improving the processes used for configuration management. This includes configuration management specialists, software and systems developers, and project managers.

---

Title: Software Engineering Technology ViTS  
ID: SWG001  
Funding Source: TBD  
Provider/Instructor: TBD  
Duration: 4 hours

Description:

Introduction to preview opportunities through which software engineering practitioners and researchers may collaborate in an effort to demonstrate the benefit of using new technologies on development projects.

Discover low-risk opportunities for your software development team to benefit from recent, applied software engineering research technologies in areas such as: requirements analysis, usability analysis, cost estimation and budget risk assessment, state-of-the-art code inspection, technical risk assessment, automated code analysis, advanced testing techniques. Find out what new software engineering technologies are available right now to help your project reduce risk, produce higher quality code, and

still meet tough deadlines. The Research Infusion strategy of the NASA Software Engineering Initiative out of the Office of the Chief Engineer has a limited number of opportunities for pilot collaborations between software engineering practitioners and software engineering researchers--and the emphasis is on demonstrating benefit to your development project. Collaborations can be structured to meet your project's requirements, some may be externally funded to cover technology transfer costs, including training, installation, and support for your team by the technology developers.

Intended audience is anyone with responsibility and authority to collaborate on infusing software engineering tools and technology into a new or existing software development/ maintenance activity, or who can influence the decision makers, for example: Team leads, software project managers, program managers; SEPG and SWG representatives; mission planning team members, SQA personnel, software developers; mission assurance managers.

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Title:	Software Inspections
ID:	HQ003
Funding Source:	GSFC/EPG
Provider/Instructor:	Forrest Schull
Duration:	1 day

Description:

Software inspection is a well-defined review process for finding and fixing defects in work products from all phases of software development. Inspections have proven time and again to be one of the most effective practices available for ensuring quality software and on-time deliveries. Many studies have demonstrated their benefits, both within NASA and across many industrial organizations, including:

- Reduced cost and improved quality by reducing rework. Studies have shown that the rework effort saved not only pays for the effort spent on inspections, but also provides additional cost savings on the project. By removing defects at their origin, inspections prevent them from propagating through multiple phases and work products, and reduce the overall amount of rework necessary on projects.
- Improved software team efficiency: Side effects of inspection meetings include improving team communication, more quickly bringing new members up to speed, and educating project members about effective development practices.

This training course provides all the information needed for conducting software inspections on a project. The course describes the process, roles, and responsibilities involved and provides experience-based guidance on all activities (including planning and scheduling the inspections, preparing for and moderating the meetings, and closing the identified defects in a timely manner).

These guidelines are based on the experiences and lessons learned from literally hundreds of inspections at NASA Centers. Since all projects are different, an emphasis

in this course is on tailoring the processes to a team's particular needs, maximizing project benefit. Interactive sessions are included that use previous experience and past defect histories to best focus the inspections on the issues that really matter. The training also includes a hands-on workshop, where the process is applied to a work product from the participants' current project. The participants leave with a list of real defects identified and clear guidance on how to proceed.

Background: All of the process recommendations contained in this course represent the best practices drawn from many NASA programs, including:

- Highly successful inspection programs previously instituted at JPL and GRC;
- Results from NASA-funded research that piloted improved inspection approaches with teams at multiple Centers;
- Lessons learned from veterans of project teams that implemented inspections successfully on their own.

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Title:	Software Life Cycle, IEEE/EIA 12207
ID:	HQ004
Funding Source:	NASA/HQ, OCE
Provider/Instructor:	Lewis Gray
Duration:	1-3 days (1-day overview + optional 2-day workshop)

Description:

IEEE/EIA 12207 is the United States implementation of ISO/IEC 12207, "Software Life Cycle Processes." IEEE/EIA 12207 is packaged in three volumes: IEEE/EIA 12207.0-1996 (the base standard), IEEE/EIA 12207.1-1997 (IEEE guide to over 100 life cycle data items), and IEEE/EIA 12207.2-1997 (IEEE guide to life cycle process implementation).

This training begins with a stand-alone, one-day introduction to IEEE/EIA 12207 for managers and personnel who need to be, or want to be, familiar with the standard. You may sign up for this one-day course only.

For those who may eventually have to use IEEE/EIA 12207 for system acquisition, there will be an additional two-day workshop. There are two pre-requisites for participating in the workshop: (1) attending the one-day course, and (2) a willingness to participate on a team that will evaluate the compatibility and the value of the IEEE/EIA 12207 standard with respect to Goddard's current and future system acquisition practices. People who plan to attend the workshop are encouraged to assemble a folder of current and planned system acquisition practices (processes and tools) in which they are stakeholders, and to bring that material with them on the first day of the workshop.

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Title:	Software Metrics ViTS
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ID: SWG002

Funding Source: TBD

Provider/Instructor: TBD

Duration: 4 hours

Description:

Presentation on a software measurement methodology that has been developed and tailored for NASA by the Fraunhofer Center - Maryland and the NASA Software Metrics Group. This tutorial will explain this methodology and the mechanics of using it for software leads on NASA projects. It will cover the motivation for software measurement, some practical examples of measurement, the steps that have already been taken within NASA to enable software leads to incorporate measurement into their projects, and the steps that software leads must take to plan and deploy software measurement. The tutorial also incorporates the measurement requirements of the new NPR for Software.

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Title: Software Project Management

ID: HQ005

Funding Source: NASA/HQ, OCE

Provider/Instructor: CSC

Duration: 5 days

Description:

The Software Project Management Course is a residential intermediate project management course targeted at those interested in increasing their knowledge of systems and software. Attendees should have some experience in managing projects (i.e., the student is familiar with project management and wants to learn how to do it better).

The course provides an overview of project management and associated topics. Classroom activities are augmented by hands-on workshops and group projects (e.g., project management plans, earned value, risk management, cost/schedule/technical performance monitoring).

The course has a heavy emphasis on software and is especially recommended for software project managers. It addresses software management tools (e.g., software builds, earned value) plus topics such as COCOMO, SLIM, function points, estimating SLOCs, trend charts, software testing, software peer reviews, and software metrics.

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Title: Software Project Planning and Control  
ID: JPL002  
Funding Source: [TBD]  
Provider/Instructor: JPL  
Duration: 2 days

Description:

This course provides both managers and software engineers with relevant information on understanding various software issues that may affect the success of their projects. The goals of this course are that participants will have an increased understanding of the software issues relative to the planning and control of software projects, and that they will be able to more effectively oversee the software aspects of their projects. Topics covered in the course include: software management overview; software life cycles; NASA and JPL standards; software planning and tracking; software considerations; software acquisition; software development environments; software engineering considerations; COTS software and reuse of software; software cost estimation software; software requirements management; software testing; software quality; software configuration management; and software management summary.

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Title: Software Quality Assurance  
ID: GSFC004  
Funding Source: [TBD]  
Provider/Instructor: GSFC, Code 300  
Duration: 2 days

Description:

[TBS – this is Code 300 training is for Code 300 SQEs]

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Title: Software Reliability  
ID: JPL003  
Funding Source: [TBD]  
Provider/Instructor: JPL  
Duration: 3 days

Description:

This course was designed for reliability engineers, systems engineers, quality assurance engineers, software engineers and testers, to provide them with hands-on exposure to software reliability measurement, analyses and design concepts. Attendees will learn the concepts for predicting failure rates or Mean Time To Fail (MTTF) by categories of criticality, methods for determining how much testing will be needed prior to the start

of development as well as how combine software and hardware measures prior to the start of development or testing. Attendees will also learn how to perform a root cause analysis on software, how to allocate system reliability to software, and the application of fault trees Failure Mode and Effects Analysis (FMEA) to software.

Topics covered include: definition of software reliability; myths about software reliability; factors that impact software reliability; overview of software reliability models; software reliability prediction models; software reliability estimation models; software fault trees; software failure mode and effects analysis (FMEA); system reliability software redundancy; improving software reliability; and managing software reliability.

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Title:	Software Requirements Development
ID:	ISD009
Funding Source:	[TBD]
Provider/Instructor:	[TBD]
Duration:	[TBD]
Description:	[TBS]

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Title:	Software Requirements Management
ID:	ISD010
Funding Source:	[TBD]
Provider/Instructor:	[TBD]
Duration:	[TBD]
Description:	[TBS]

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Title:	Software Safety ViTS
ID:	HQ006
Funding Source:	NASA/HQ, OCE
Provider/Instructor:	Nancy Leveson
Duration:	Approx. 55 hours
Description:	

Software allows unprecedented levels of complexity and new failure modes that are starting to overwhelm the standard approaches to ensuring safety. The causes of accidents are even changing. This class will focus on the unique problems involved in building software-controlled systems. Emphasis will be on procedures and techniques that are practical enough to be applied to projects today. Real-project experiences with these techniques in different application areas will be described and recent software-

related accidents will be reviewed and analyzed. The goal of this class is not to learn how to satisfy various standards but rather how to design a tailored program that will be most effective for your project. Participants will work on example problems in small groups.

Topics include: the problem including accident causes, computers and risk, and safety vs. reliability; a holistic control-based approach to system safety; system hazard analysis for complex, software-intensive systems; software hazard analysis; software requirements specification/modeling and analysis; principles of safe design including system and software and human-machine interaction; verification of safety; and organization and management of safety-critical projects.

The audience is intended to include systems and software engineering managers and practitioners.

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Title:	Software Testing Management Workshop
ID:	ISD011
Funding Source:	[TBD]
Provider/Instructor:	Teraquest
Duration:	2 days
Description:	[TBS]

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Title:	Software Testing Practices Workshop
ID:	ISD012
Funding Source:	[TBD]
Provider/Instructor:	Teraquest
Duration:	2 days
Description:	[TBS]

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Title:	Standard CMMI Appraisal Method for Process Improvement (SCAMPI) Lead Appraiser Training
ID:	SEI007
Funding Source:	NASA/HQ
Provider/Instructor:	CSM
Duration:	5 days
Description:	[TBS]

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Title: Systematic Decision Making  
ID: ISD013  
Funding Source: [TBD]  
Provider/Instructor: [TBD]  
Duration: [TBD]  
Description: [TBS]

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Title: Systems Requirements  
ID: APPL002  
Funding Source: [TBD]  
Provider/Instructor: APPL/NET  
Duration: 3 days

Description:

This course will provide system engineers and other technical personnel with a proven process to obtain information needed before writing requirements and to write good requirements. The seminar has the following objectives:

- To define the steps of a good requirements writing process (i.e., discuss how to ensure that the scope of the project (product) is defined and agreed upon before investing in writing requirements), as well as outline what information needs to be obtained and how to obtain it;
- To learn what makes bad versus good requirements and how to more easily write good requirements that will not cause problems later in the process; and
- To learn how to organize requirements into a specification and what other data is needed to capture in your specification to ensure life cycle management of requirements.

The intended audience includes system engineers, engineers, scientists, and others whose responsibility includes writing or reviewing requirements for products, whether hardware, software, or systems.

Highlights include lectures, hands-on exercises, and reviews of the participants' own projects and products will be used to impart steps to enable participants to immediately improve their requirements process. Questions will also be answered on how to overcome existing problems.

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Title: Systematic Software Testing  
ID: ISD014  
Funding Source: [TBD]  
Provider/Instructor: SQE  
Duration: 3 days  
Description: [TBS]

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Title: Technical Manager's Training  
ID: GSFC002  
Funding Source: [TBD]  
Provider/Instructor: [TBD]  
Duration: 6 days

Description:

The Technical Manager's Training is a residential program that focuses on presenting a high level overview of how work gets done in the Goddard environment. The course objectives are to:

- Learn about the Life Cycle of a project within the Goddard environment;
- Get familiar with principles of good Project Management (how to plan, organize, implement, and control technical projects); and
- Learn principles of how to increase effectiveness within work teams through collaborative team participation.

There is a two-hour orientation at Goddard Greenbelt, six full days at Wallops and an hour and a half wrap-up session the following week in Goddard Greenbelt. The course begins on a Sunday and ends on a Friday. Developmental activities begin on the bus ride to Wallops.

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Title: Using CMMI for Improvement at GSFC  
ID: GSFC003  
Funding Source: GSFC/EPG  
Provider/Instructor: GSFC/Sally Godfrey  
Duration: 2 hours  
Description: [TBS]

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Domain-specific Training:

For each identified domain, the following courses should be considered:

- Introduction to [Domain] Software
- Developer Training
- Management Training
- Software Manager Training
- Sustaining Engineering Preparation Training
- System Engineering Training
- Test Lead Training
- Tester Training

## D.2 Mentoring/Deployment Lecture Descriptions

This section presents a list of briefings intended to facilitate mentoring/deployment. As these lectures are offered, historical information will be captured including instructors, date(s) held, and brief descriptions. Table D-1 lists lectures that have already been identified along with a lecture identification number (Lecture ID). The rest of this section provides additional details for these lectures including lecture descriptions, presenter(s), and date(s) held.

**Table D-1. ISD Lectures**

<b>Lecture Title</b>	<b>Lecture ID</b>
Are We Getting Our Money's Worth?	L001
Basic Principles of CM for Software	L002
Basic Steps in Estimating Cost	L003
Classifying Your Software	L004
CM Audits	L005
Defect Prevention	L006
Dos and Don'ts of Project Planning	L007
FSW 101	L008
Getting Started with Metrics	L0009
How Does CMMI Affect Me?	L010
Is Your Software Safe?	L011
ITA and its Implications to GSFC Projects	L012
Key Elements of a Successful CM Activity	L013
NPR 7150.2	L014
Preparing for CMMI Appraisals	L015
Project Manager's Guidance for Deploying the Project's Process	L016
Software Quality Assurance at the GSFC	L017
Software Reliability	L018
SQA for Software	L019
Structure of Process Documentation	L020
Ten Elements of Improved Software Development	L021

<b>Lecture Title</b>	<b>Lecture ID</b>
Top Ten Steps to Success for Software Management	L022
Top Ten Steps to Successful Software Development	L023
Use of ISD Web Site	L024
Useful Measurement for Projects	L025
What CMMI Means to You	L026
What is the GSFC Process Baseline?	L027

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Lecture Title: Are We Getting Our Money's Worth?

Lecture ID: L001

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

- Do processes really matter?
- Do they help save money?
- What does it cost to apply required processes?

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Lecture Title: Basic Principles of CM for Software

Lecture ID: L002

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

- Key elements of a successful CM activity
- Better Progress Tracking for Your Projects

---

Lecture Title: Basic Steps in Estimating Cost

Lecture ID: L003

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description: TBD

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Lecture Title: Classifying Your Software  
Lecture ID: L004  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description: Discusses using the NASA SW Classification Process

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Lecture Title: CM Audits  
Lecture ID: L005  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description: Discusses FCAs, PCAs, and when to conduct them

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Lecture Title: Defect Prevention  
Lecture ID: L006  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description:  
- Are there basic steps to take to minimize defects creeping in?  
- What are the most effective processes, management techniques?

---

Lecture Title: Dos and Don'ts of Project Planning  
Lecture ID: L007  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description:  
- What comprises good planning?  
- What are signs of poor plans? good plans?

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Lecture Title: FSW 101  
Lecture ID: L008  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description: TBD

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Lecture Title: Getting Started with Metrics  
Lecture ID: L009  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description: Discusses core metrics and how to measure to manage

---

Lecture Title: How Does CMMI Affect Me?  
Lecture ID: L0010  
Presenter(s): TBD  
Date(s) Held: TBD

Lecture Description:

- What are we doing in ISD, FSW, other groups?
  - If I'm not a Class B or C project, does this affect me?
  - Is there any value for me if I'm not in a group targeted for CMMI levels?
- 

Lecture Title: Is Your Software Safe?  
Lecture ID: L011  
Presenter(s): TBD (Code 300 to develop)  
Date(s) Held: TBD  
Lecture Description: TBD

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Lecture Title: ITA and its Implications to GSFC Projects  
Lecture ID: L012  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description: TBD (Rich Day, et al.)

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Lecture Title: Key Elements of a Successful CM Activity  
Lecture ID: L013  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description: TBD

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Lecture Title: NPR 7150.2

Lecture ID: L014

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

- How does it affect me?
- What are the key differences from what is currently in place (or in practice)
- How do I implement it on my project?
- What does it require from the contractors?
- How Center documentation will change for classes of software

---

Lecture Title: Preparing for CMMI Appraisals

Lecture ID: L015

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

- General appraisal process
- What do I need to know?
- What types of documentation are required?
- How long will it tie up my time?
- How should I prepare?

---

Lecture Title: Project Manager's Guidance for Deploying the Project's Process

Lecture ID: L016

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

- Identifying and documenting the project's processes
  - Process orientation meetings
  - Setting up project repositories
-



Lecture Title: Software Quality Assurance at the GSFC

Lecture ID: L017

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

Discusses what SQ really do and how do their efforts differ from IV&V

---

Lecture Title: Software Reliability

Lecture ID: L018

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description: TBD

---

Lecture Title: SQA for Software

Lecture ID: L019

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

- What works, what doesn't
  - Role of the QA staff
  - Are audits effective? (What do good ones look like?)
- 

Lecture Title: Structure of Process Documentation

Lecture ID: L020

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

- How to find what you need
  - Tailoring and use guidance
  - How to provide feedback
-

Lecture Title: Ten Elements of Improved Software Development

Lecture ID: L021

Presenter(s): Frank McGarry (CSC) and Bill Decker (CSC)

Date(s) Held: 2/14/05

Lecture Description:

Over the past 10 to 15 years, CSC has conducted many aggressive software process improvement programs, both for internal improvement as well as improvement programs for clients. Specific experiences from 12 major programs covering the period 1994 through 2004 have been accumulated and analyzed by several of the principals participating in these improvement efforts. Detailed records, experiences, observations and empirical data have been archived from these programs in order to continually improve the approach to establishing new initiatives. Most of the improvement programs have been highly successful (as measured by attaining high levels of CMM(I) ratings as well as demonstrating improved product performance). The experiences have been a result of efforts with CMM, CMMI, ISO, SA-CMM, as well as efforts in improvement initiatives without particular models being used as a benchmark. Numerous papers, reports, and briefings describing varying perspectives of these experiences have been produced. These are used by CSC as the experience base of process improvement information which are applied as new programs are initiated.

From all of these experiences, a series of key practices has been identified that seem to play the most significant role in enabling the success of the improvement efforts. This set continually evolves over time as additional experiences are captured from new programs. This briefing will describe the 'Ten Elements of Improved Software Development' as derived from experiences of the 12 CSC improvement programs through 2004.

---

Lecture Title: Top Ten Steps to Success for Software Management

Lecture ID: L022

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description: TBD

---

Lecture Title: Top Ten Steps to Successful Software Development

Lecture ID: L023

Presenter(s): TBD

Date(s) Held: TBD

Lecture Description:

Discusses the most critical elements of sound practices (reflected in our process baseline)

---

Lecture Title: Use of ISD Web Site  
Lecture ID: L024  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description: TBD

---

Lecture Title: Useful Measurement for Projects  
Lecture ID: L025  
Presenter(s): TBD  
Date(s) Held: TBD  
Lecture Description:

- What works and doesn't work for measurement
  - Lessons from adopting measures (dos and don'ts)
  - How much does it cost?
  - What are the key ingredients?
- 

Lecture Title: What CMMI Means to You  
Lecture ID: L026  
Presenter(s): TBD  
Date(s) Held: TBD

Lecture Description:

- Description of the basic themes of CMMI and how it applies to all software (not just appraisal candidates)
  - How CMMI and the GSFC Process Baseline are in synch
  - What are the basic activities any project should do
- 

Lecture Title: What is the GSFC Process Baseline?  
Lecture ID: L027  
Presenter(s): TBD  
Date(s) Held: TBD

Lecture Description:

- What do I have to do/ what is optional?
- What help can I get in carrying out software process adoption?

- If I follow the baseline, will I be CMMI compliant?

---

## Appendix E. Points of Contact for ISD Training Providers

Training Provider	Point(s) of Contact	Title	Telephone	E-mail
APPL	[TBS]	[TBS]	[TBS]	[TBS]
CSM	[TBS] <sup>7</sup>	[TBS]	[TBS]	[TBS]
FSW	Elaine Shell	Head, Flight Software Branch	(301) 286-2628	Elaine.M.Shell@nasa.gov
GSFC	[TBS]	[TBS]	[TBS]	[TBS]
HQ	[TBS] <sup>7</sup>	[TBS]	[TBS]	[TBS]
ISD	Sally Godfrey	Lead, Engineering Process Group	(301) 286-5706	Sara.H.Godfrey@nasa.gov
JPL	[TBS] <sup>8</sup>	[TBS]	[TBS]	[TBS]
QIC	Tim Olson	President, QIC	(760) 804-1405	[TBS]
SEI	[TBS] <sup>7</sup>	[TBS]	[TBS]	[TBS]
SQE	[TBS] <sup>7</sup>	[TBS]	[TBS]	[TBS] <a href="http://www.sqe.com">http://www.sqe.com</a>
Teraquest	[TBS] <sup>7</sup>	[TBS]	[TBS]	[TBS]

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<sup>7</sup> Classes funded by HQ OCE should be negotiated through training coordinator. A central point of contact is needed since requests are made annually by the Center, not on an individual basis.

<sup>8</sup> Coordinated through training coordinator

## **Appendix F. Sample Forms**


This appendix present sample forms including various registration forms, a training waiver form, training evaluation forms (single and multiple instructor), lecture evaluation forms, and training attendance lists.

## **F.1 On-Line Registration Form**

[TBS – sample on-line registration form for in-house-developed courses]

## F.2 GSFC Form 17-117

This form is available from the OHR website, <http://ohr/DevGuide/Home.htm>. Once completed, the form is e-mailed to your direct supervisor who, after approving it, forwards it to the Directorate Training Coordinator. The Directorate Training Coordinator then forwards it to the GSFC Training Office for subsequent registration.

 <p>National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt, Maryland 20771</p>	<b>REQUEST, AUTHORIZATION, AGREEMENT AND CERTIFICATION OF TRAINING</b>	OFFICE USE ONLY <div style="border: 1px solid black; height: 40px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 20px; margin-top: 5px;"></div> <div style="border: 1px solid black; height: 20px; margin-top: 5px;"></div>
<b>SECTION I – INITIATING OFFICE</b>		
1. NAME OF APPLICANT (Last, First, M.I.)		2. CODE OF APPLICANT
3. JOB TITLE	4. TEL. EXT	5. FAX NUMBER
6. E-MAIL ADDRESS		
7. POSITION LEVEL: <input type="checkbox"/> A. NON-SUPERVISORY <input type="checkbox"/> B. SUPERVISORY		8. FUNDING SOURCE <input type="checkbox"/> DIRECTORATE <input type="checkbox"/> CENTER <input type="checkbox"/> NASA <input type="checkbox"/> OTHER (e.g., R&D etc. _____)
<b>IF TRAINING IS OFF-SITE COMPLETE ITEMS 9-13 (otherwise skip items 9-13)</b>		
9. NAME OF ORGANIZATION CONDUCTING TRAINING		10. LOCATION OF TRAINING (City & State)
11. ADDRESS (including ZIP Code), PHONE AND FAX NUMBERS OF ORGANIZATION TO WHICH NASA SHOULD SEND PAYMENT		
12. TRAINING COSTS A. TUITION _____ B. BOOKS _____ C. FEES/OTHER _____ D. TUITION & FEES TOTAL _____		
13. TRAVEL COSTS A. TRAVEL _____ B. PER DIEM _____ C. OTHER _____ D. TRAVEL TOTAL _____		
14. IF THIS COURSE IS ON-SITE AND YOU REQUIRE SPECIAL ACCOMMODATIONS, PLEASE CHECK HERE <input type="checkbox"/>		
15. COURSE TITLE (If off-site attach a copy of the course description and the cost information)		16. CATALOG/COURSE # (If applicable)
17. COURSE LEVEL (Mark (X) one only) <input type="checkbox"/> A. NON - ACADEMIC <input type="checkbox"/> B. GRADUATE <input type="checkbox"/> C. UNDERGRADUATE <input type="checkbox"/> D. SECONDARY ACADEMIC		
18. CENTER-FUNDED ACADEMIC PROGRAMS (Please indicate if course is part of any of the following) <input type="checkbox"/> A. USP <input type="checkbox"/> B. PTGSP <input type="checkbox"/> C. RSFP <input type="checkbox"/> D. WRI <input type="checkbox"/> E. COOP <input type="checkbox"/> F. OTHER _____		
19. COURSE DATES (Mo., day, yr.) A. From _____ B. To _____	20. NO. OF COURSE HOURS A. During Duty _____ B. Non-Duty _____	21. IF ACADEMIC, NUMBER OF CREDITS
22. JUSTIFICATION FOR TRAINING <input type="checkbox"/> RELATED TO CURRENT/FUTURE JOB DUTIES <input type="checkbox"/> RELATED TO NASA MISSION <input type="checkbox"/> OTHER (brief justification required; you may attach separate document)		
<b>SECTION II – RECOMMENDED APPROVALS AND SIGNATURES</b>		
NOTICE – If training is Academic signature at right (item 23) constitutes an agreement to continue in service, per conditions on reverse		23. SIGNATURE OF APPLICANT
24. DATE		
25. NAME AND TITLE OF IMMEDIATE SUPERVISOR		26. SIGNATURE
27. DATE		
28. NAME AND TITLE OF SECOND LEVEL SUPERVISOR		29. SIGNATURE
30. DATE		
31. NAME OF DIRECTORATE TRAINING COORDINATOR	32. FAX #	33. SIGNATURE
34. DATE		
<b>SECTION III – GODDARD TRAINING/PROCUREMENT OFFICE</b>		
35. TRAINING APPROVED <input type="checkbox"/> A. YES <input type="checkbox"/> B. NO	36. AMOUNT	37. SIGNATURE OF TRAINING OFFICIAL
38. DATE		



39. SAP ENTRY A. INITIALS                      B. DATE		40. SENT TO ACCOUNTING A. INITIALS                      B. DATE		41. SIGNATURE OF CONTRACTING OFFICER	42. DATE
43. COST CTR: _____ ORDER: _____ FUND: _____		44. DOCUMENT/ PURCHASE ORDER NO.			
46. AUTHORIZED REIMBURSEMENT AMOUNT UP TO:		45. CREDIT CARD PAYMENT: _____ INITIALS: _____ DATE: _____		47. PPC	
49. VENDOR ID:		50. CAGE CODE:		48. BILLING INSTRUCTIONS (Furnish invoice to): NASA Goddard Space Flight Center Career Development & Emp. Worklife Office, Code 114 Greenbelt Road, Greenbelt MD 20771	

GSFC 17-117 (07/03) Previous editions may be used. See Page 2 for Privacy Act Notice and Obligated Service Agreement.

## **PRIVACY ACT NOTICE**

**GENERAL** - This information is provided pursuant to Public Law 93-579 (Privacy Act of 1974). December 31, 1974, for and as amended individuals completing Federal nomination for training forms.

**AUTHORITY** - The Government Employees Training Act of 1953 (U.S. Code, Title 5, Sections 4101 to 4118).

**PURPOSES AND USES** - The information on this form is used in the administration of the Federal Training Program. The purpose of this form is to document the nomination of trainees and completion of training; and it serves as the principal repository of personal, fiscal and administrative information about trainees and the programs in which they participate. The form becomes a part of the permanent employment record of participants in training programs and is included in the Government's Central Personnel Data File.

**Effect of Nondisclosure** - Personal information provided on this form is given on a voluntary basis, as is participation in any training program. Failure to provide this information, however, may result in ineligibility for participation in training programs.

## **OBLIGATED SERVICE AGREEMENT**

For all NASA-funded academic training, employees incur a period of obligated service equal to three times the length of the training. This means that the employee agrees to remain in the employment of NASA for the obligated service period, which begins at the conclusion of the course. Time spent attending the class during non-duty hours and time granted off from work is counted in the total hours of training. (However, if an employee attends class during duty time granted off from work, class time is not counted).

### **EXAMPLE:**

Employee attends a three-credit course during duty hours, and receives 8 hours off per week to attend class and study/prepare class assignments.

8 hours X 15 weeks = 120 hours off for the semester

120 X 3 = 360 hours (this is the period of obligated service)

Obligated service period begins at the conclusion of the semester in which the course occurs.

### **REIMBURSEMENT:**

If an employee fails to complete the period of obligated service, he or she is obligated to pay back a proportional share of training funds expended.

### **EXAMPLE CONTINUED:**

Employee works off 180 hours of the 360 hours obligation. The employee therefore owes 50% of the

Training funds expended.

GSFC 17-117 (07/03) Previous editions may be used.

### F.3 NASA APPL/NET Participant Nomination Form



## NASA Academy of Program and Project Leadership (APPL) & NASA Engineering Training (NET) Participant Nomination Form

Please check the program name and insert the session number for this nomination (refer to the current Agencywide Schedule):

#### APPL Programs

- |  |       |     |
|--|-------|-----|
| <input type="checkbox"/> Advanced Project Management           | APM   | ___ |
| <input type="checkbox"/> Construction of Facilities Mgmt       | CoF   | ___ |
| <input type="checkbox"/> CoF Best Practices                    | CBP   | ___ |
| <input type="checkbox"/> Energy Efficiency & Water Conservat'n | EEWC  | ___ |
| <input type="checkbox"/> International Project Management      | IPM   | ___ |
| <input type="checkbox"/> Introductory Environmental Mgmt Pgm   | IEMP  | ___ |
| <input type="checkbox"/> Program Management                    | PGM   | ___ |
| <input type="checkbox"/> Project Leadership                    | PL    | ___ |
| <input type="checkbox"/> Project Management                    | PM    | ___ |
| <input type="checkbox"/> PM Shared Experiences                 | PMSEP | ___ |
| <input type="checkbox"/> Real Property                         | RP    | ___ |
| <input type="checkbox"/> Reliability Centered Bldg/Equipment   | RCB&E | ___ |
| <input type="checkbox"/> Systems Engineering                   | SE    | ___ |
| <input type="checkbox"/> Technology Transfer/Comm'lization     | TTC   | ___ |

#### NET Programs

- |   |       |     |
|---|-------|-----|
| <input type="checkbox"/> Aeronautics                                    | AERO  | ___ |
| <input type="checkbox"/> Concurrent Design Exercises                    | CDE   | ___ |
| <input type="checkbox"/> Earth Science                                  | ES    | ___ |
| <input type="checkbox"/> Engineer Certificate Program (selective)       | ECP   | ___ |
| <input type="checkbox"/> Human Expl. & Development of Space             | HEDS  | ___ |
| <input type="checkbox"/> Life and Microgravity Sciences                 | LMS   | ___ |
| <input type="checkbox"/> Manufacture of Space Hardware                  | MSH   | ___ |
| <input type="checkbox"/> Manufacturing Systems & Processes              | MANU  | ___ |
| <input type="checkbox"/> NET Design Exercise                            | NDE   | ___ |
| <input type="checkbox"/> Software Acquisition Mgmt                      | SAM   | ___ |
| <input type="checkbox"/> Software Process Assessment                    | SPA   | ___ |
| <input type="checkbox"/> Software Process Improvement                   | SPI   | ___ |
| <input type="checkbox"/> Space Launch & Transportation Sys.             | SLTS  | ___ |
| <input type="checkbox"/> Space Science                                  | SS    | ___ |
| <input type="checkbox"/> System Design                                  | SD    | ___ |
| <input type="checkbox"/> System Requirements                            | REQ   | ___ |
| <input type="checkbox"/> Topics in Engineering                          | TE    | ___ |
| <input type="checkbox"/> Verificat'n, Validat'n, Test & Eval of Systems | VWT&E | ___ |

**NOTE: PROGRAM/PROJECT MANAGEMENT DEVELOPMENT PROCESS (PMDP) PARTICIPANTS ARE GIVEN PRIORITY**

Date enrolled in PMDP: \_\_\_\_\_ PMDP Level (if applicable): \_\_\_\_\_ 1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4

Please complete the participant information for this nomination:

Mr. Ms. Dr. Full

Name: \_\_\_\_\_ SSN\*: \_\_\_\_\_  
Name to be used on name tag: \_\_\_\_\_

Phone: ( ) \_\_\_\_\_ Fax: ( ) \_\_\_\_\_

Nominee's E-mail: \_\_\_\_\_ Supervisor's E-mail: \_\_\_\_\_

Functional Position Title (i.e. Chief, XYZ Branch) \_\_\_\_\_ Grade: \_\_\_\_\_

Center or Organization: \_\_\_\_\_ Mail Stop: \_\_\_\_\_

Street Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Gender: ☐ Female ☐ Male Citizenship: ☐ USA ☐ Other: \_\_\_\_\_ Birth Month/Day: \_\_\_\_\_

Degree Level: ☐ B.S./B.A. ☐ Masters ☐ Ph.D. ☐ Other: \_\_\_\_\_ Years of PM Experience: \_\_\_\_\_

Special Dietary, Medical, Physical or other requirements: \_\_\_\_\_

#### SIGNATURE APPROVALS

\_\_\_\_\_  
Nominee's Signature Date

\_\_\_\_\_  
Supervisor's Signature Date

\_\_\_\_\_  
Travel Authorization Agent Signature Date

\_\_\_\_\_  
Training Officer's Signature Date

Completed Forms should be returned to your  
designated APPL or NET Training Representative

Questions? Please call RGI at (703) 820-4900 or  
visit our Web site at <http://appl.nasa.gov>

\*Disclosure of your social security number is completely voluntary. It is used as a unique identifier in a database which tracks program history and provides participants with a cumulative history of their attendance at programs, and it helps avoid duplicate records. This information is never printed on any documents or disclosed in any way.

## F.4 Training Waiver Form

ISD Training Waiver	
<b>Training Course:</b>	
<b>Applicant Name:</b>	<b>Applicant Organization:</b>
<b>Applicant Phone:</b>	<b>Applicant Location (Bldg/Rm.):</b>
<b>Reason for Waiver:</b>  <input type="checkbox"/> Previous experience in this area Describe:   <input type="checkbox"/> Received on-the-job training Describe:   <input type="checkbox"/> Took a similar course, but not this same course Describe:   <input type="checkbox"/> Took a college class in this area <input type="checkbox"/> Other: Please Explain	
<b>Remarks:</b>	
<b>Applicant Signature:</b>	<b>Date:</b>
<b>Supervisor Signature:</b>	<b>Date:</b>
Form ISD-[TBD], Baseline, January 2005	

## F.5 Training Evaluation (Single Instructor)

**Title:** [Insert]

**Training Date(s):** [Insert]

**Instructor:** [Insert]

**Instructions:** Please check the box(es) that correspond(s) with your opinion.

	No		Some		Very
Was the presentation informative?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Did this presentation increase your understanding of the subject?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Did the presentation meet your expectations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What specific parts of the presentation do you believe will be the most valuable to you?

---

---

What specific parts were of the least value to you?

---

---

	Poor				Excellent
Overall impression of the materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall evaluation of the instructor's knowledge of the subject matter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall evaluation of the instructor's presentation delivery style	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Suggestions for additional topics: \_\_\_\_\_  
\_\_\_\_\_

Suggestions for topics to be removed: \_\_\_\_\_  
\_\_\_\_\_

Would you recommend this training (circle one)?    YES                  NO

Why or why not? \_\_\_\_\_  
\_\_\_\_\_

Other comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you for your feedback! Please leave this form with your instructor.

## F.6 Training Evaluation (Multiple Instructors)

**Title:** [Insert]

**Training Date(s):** [Insert]

**Instructors:** [Insert Names]

**Instructions:** Please check the box(es) that correspond(s) with your opinion.

	No		Some		Very
Was the presentation informative?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Did this presentation increase your understanding of the subject?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Did the presentation meet your expectations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What specific parts of the presentation do you believe will be the most valuable to you?

---

---

What specific parts were of the least value to you?

---

---

	Poor				Excellent
Overall impression of the materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instructor - [insert name]					
Overall evaluation of the instructor's knowledge of the subject matter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall evaluation of the instructor's presentation delivery style	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instructor - [insert name]					
Overall evaluation of the instructor's knowledge of the subject matter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall evaluation of the instructor's presentation delivery style	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instructor - [insert name]					
Overall evaluation of the instructor's knowledge of the subject matter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall evaluation of the instructor's presentation delivery style	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instructor - [insert name]					
Overall evaluation of the instructor's knowledge of the subject matter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall evaluation of the instructor's presentation delivery style	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Suggestions for additional topics: \_\_\_\_\_  
\_\_\_\_\_

Suggestions for topics to be removed: \_\_\_\_\_  
\_\_\_\_\_

Would you recommend this training (circle one)?    YES                    NO

Why or why not? \_\_\_\_\_  
\_\_\_\_\_

Other comments:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you for your feedback! Please leave this form with one of your instructors.



## F.7 Lecture Evaluation Form

<b>Lecture Title</b> <b>Speaker, Affiliation</b> <b>Day, Date Start Time - Stop Time</b> <b>Building #, Room #</b>					
<b>Name (please print)</b> _____	<b>Con- tractor?</b> _____	<b>Affiliation</b> _____			
Mark your responses by placing an "X" next to one of the numbers 1-5 <b>5 - Totally Agree; 4 - Agree very much; 3 - Agree; 2 - Disagree; 1 - Totally Disagree</b> <b><u>Please place your additional comments (positive or negative constructive criticism) in the designated box at the end of this form.</u></b>					
Statement	totally agree	agree very much	agree	disagree	totally disagree
1. This talk was beneficial to me.	____5	____4	____3	____2	____1
2. I would recommend this talk to others.	____5	____4	____3	____2	____1
3. I think some of the content should be changed.	____5	____4	____3	____2	____1
4. I wish I had not come.	____5	____4	____3	____2	____1
5. I thought the presentation was interesting.	____5	____4	____3	____2	____1
6. I think that the materials presented can be successfully applied to my project.	____5	____4	____3	____2	____1
7. As a result of this session I will be able to use this material more easily.	____5	____4	____3	____2	____1
8. I would definitely take a similar class taught by this person in the future.	____5	____4	____3	____2	____1
<b>Enter comments in the box below.</b>					

## F.8 Training Attendance List

**Training Title:** [Insert]

**Training Date(s):** [Insert]

**Instructor(s):** [Insert]

Page \_\_\_\_\_ of \_\_\_\_\_

Name

## Affiliation

E-MailTelephone[illegible]

## Appendix G. Acronyms and Abbreviations

AETD	Applied Engineering and Technology Directorate
APPL	NASA's Academy of Program and Project Leadership
AQM	Acquisition Manager
ATTR	acceptance test readiness review
AV	audiovisual
CAR	causal analysis and resolution
CCB	configuration control board
CI	configuration item
CM	configuration management
CMM	Capability Maturity Model
CMO	Configuration Management Officer
CMMI	Capability Maturity Model Integration
COCOMO	Constructive Cost Model
COTS	commercial-off-the-shelf
CRM	continuous risk management
CSC	Computer Sciences Corporation
CSM	Center for Systems Management (training vendor for HQ OCE)
CURS	cursory
DAR	decision analysis and resolution
DE	Development Engineer
DTL	Development Team Lead
EIA	Electronic Industries Alliance
EPG	Engineering Process Group
EXP	expert
FCA	Functional Configuration Audit
FDD	Flight Dynamics Division
FMEA	Failure Mode and Effects Analysis
FSB	Flight Software Branch
FSW	flight software

FY	fiscal year
GOTS	government-off-the-shelf
GPR	Goddard Procedural Requirement
GSFC	Goddard Space Flight Center
HQ	NASA Headquarters
IEEE	Institute of Electrical and Electronics Engineers
IPM	integrated project management
ISD	Information Systems Division
ISM	integrated supplier management
ISO	International Organization for Standardization
IT	information technology
IT	integrated teaming
IV&V	Independent Verification and Validation
JPL	Jet Propulsion Laboratory
LM	Lab Manager
MA	measurement and analysis
ME	Maintenance Engineer
MGR	Line Manager
ML4	maturity level 4
ML5	maturity level 5
MSFC	Marshall Space Flight Center
MSG	Management Steering Group
MTL	Maintenance Team Lead
MTTF	Mean Time To Fail
NASA	National Aeronautics and Space Administration
NET	NASA Engineering Training
NPD	NASA Program Directive
NPR	NASA Procedural Requirement
OCE	Office of Chief Engineer
OEI	organizational environment for integration
OHR	Office of Human Resources

OID	organizational innovation and deployment
OPD	organizational process definition
OPF	organizational process focus
OPP	organizational process performance
OT	organizational training
PA	process area
PAL	process asset library
PCA	Physical Configuration Audit
PCM	Process Change Methodology
PDL	Product Development Lead
PE	Process Engineer
PI	product integration
PM	project management
PMC	project monitoring and control
PP	Product Plan
PP	project planning
PPQA	process and product quality assurance
PROF	proficient
QIC	Quality Improvement Consultants, Inc.
QMS	Quality Management System
QPM	quantitative project management
R&D	research and development
RD	requirements development
REQM	requirements management
RFA	request for action
RID	review item disposition
RSKM	risk management
S/W	software
SA	Software Acquisition
SAM	supplier agreement management
SCAMPI	Standard CMMI Appraisal Method for Process Improvement

SE	System Engineer
SEI	Software Engineering Institute
SEL	Software Engineering Laboratory
SEPG	Software Engineering Process Group
SLIM	Software Lifecycle Model
SLOC	source lines of code
SM	Software Manager
SMP	Software Management Plan
SPI	software process improvement
SQE	Software Quality Engineer, Software Quality Engineering
STE	Simulator/Tools Engineer
STR	Software Technology Researcher
SW	software
SWG	Software Working Group
TBD	to be determined
TBR	to be resolved
TBS	to be supplied
TE	Test Engineer
TEAS	Technology Education and Assessment Seminars
TS	technical solution
TTL	Test Team Lead
URL	Uniform Resource Locator
VAL	validation
VER	verification
ViTS	Video Teleconferencing System
WBS	work breakdown structure